HP StorageWorks
Multi-protocol router installation guide

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Multi-protocol router installation guide

Contents

Figures

Tables

About this guide

This guide provides information about:

- Setting up and configuring the HP StorageWorks Multi-protocol Router (MP Router)
- Maintaining and operating the MP Router
- Basic troubleshooting and diagnostics

Intended audience

This guide is intended for system administrators and technicians who are experienced with the following:

- HP StorageWorks Fibre Channel (FC) Storage Area Network (SAN) switches
- XPath Operating System (OS) 7.4.x or earlier

Related documentation

Documentation, including white papers and best practices documents, is available on the HP web site:

http://www.hp.com/country/us/eng/prodserv/storage.html

To access current XPath OS 7.4.x related documents:

1. Locate the **IT storage products** section of the web page.
2. Under **Networked storage**, click the **SAN Infrastructure** subsection.
3. From the **SAN Infrastructure** web page, locate the **SAN Infrastructure products** section.
4. Click **Multi-protocol Routers and Gateways**.
5. To access XPath OS 7.4.x documents (such as this document), click **B-Series Multi-Protocol Router**.

   The **HP StorageWorks B-Series Multi-Protocol Router** overview page appears.
6. Go to the **Product Information section**, located on the right side of the web page.
7. Click **Technical documentation**.
8. Follow the onscreen instructions to download XPath OS 7.4.x documents.

Document conventions and symbols

Table 1 Document conventions

Convention	Element
Medium blue text: Figure 1	Cross-reference links and e-mail addresses
Medium blue, underlined text (http://www.hp.com)	Web site addresses
Bold font	• Key names • Text typed into a GUI element, such as into a box • GUI elements that are clicked or selected, such as menu and list items, buttons, and check boxes
Italics font	Text emphasis
`Monospace font`	• File and directory names • System output • Code • Text typed at the command line
`Monospace, italic font`	• Code variables • Command-line variables
`Monospace, bold font`	Emphasis of file and directory names, system output, code, and text typed at the command line

WARNING! Indicates that failure to follow directions could result in bodily harm or death.

CAUTION: Indicates that failure to follow directions could result in damage to equipment or data.

IMPORTANT: Provides clarifying information or specific instructions.

NOTE: Provides additional information.

Rack stability

⚠ **WARNING!** To reduce the risk of personal injury or damage to equipment:

- Extend leveling jacks to the floor.
- Ensure that the full weight of the rack rests on the leveling jacks.
- Install stabilizing feet on the rack.
- In multiple-rack installations, secure racks together.
- Extend only one rack component at a time. Racks may become unstable if more than one component is extended.

HP technical support

Telephone numbers for worldwide technical support are listed on the HP support web site: http://www.hp.com/support/.

Collect the following information before calling:

- Technical support registration number (if applicable)
- Product serial numbers
- Product model names and numbers
- Applicable error messages
- Operating system type and revision level
- Detailed, specific questions

For continuous quality improvement, calls may be recorded or monitored.

HP strongly recommends that customers sign up online using the Subscriber's choice web site: http://www.hp.com/go/e-updates.

- Subscribing to this service provides you with e-mail updates on the latest product enhancements, newest versions of drivers, and firmware documentation updates as well as instant access to numerous other product resources.
- After signing up, you can quickly locate your products by selecting **Business support** and then **Storage** under Product Category.

HP-authorized reseller

For the name of your nearest HP-authorized reseller:

- In the United States, call 1-800-282-6672.
- Elsewhere, visit the HP web site: http://www.hp.com. Then click **Contact HP** to find locations and telephone numbers.

Helpful web sites

For other product information, see the following HP web sites:

- http://www.hp.com
- http://www.hp.com/go/storage
- http://www.hp.com/support/
- http://www.docs.hp.com

1 Overview

The MP Router is a high-performance, 8-port or 16-port, 2 gigabit (Gb) router that passes data between storage devices, hosts, and servers in a Storage Area Network (SAN). The MP Router integrates XPath OS 7.4.x, and is compatible with the HP StorageWorks switch product family.

MP Router models include:

- HP StorageWorks Multi-protocol Router Base—An 8-port multi-protocol router providing FC Subnet Routing, FCIP Tunneling and iSCSI Gateway service.
- HP StorageWorks Multi-protocol Router Full—A 16-port multi-protocol router providing FC Subnet Routing, FCIP Tunneling and iSCSI Gateway service.

NOTE: See the *HP StorageWorks Multi-protocol XPath OS 7.4.x release notes* for a complete list of management features enabled on your specific model.

This chapter provides the following information:

Hardware features

The MP Router uses a multiple-board design. Below the system board in the chassis is a DC-power printed circuit board (PCB) that provides the required system voltages. These voltages are derived from and regulated by redundant power supply units. This regulated power is bused via a connector to the main system PCB.

Mounted on top of the system board is a daughter board with a highly integrated PowerPC-family CPU (800MHz PowerPC 745x). It contains a high-performance RISC processor core with SDRAM controller, PCI bus interface, peripheral local bus for external ROM and peripherals, DMA, I^2C interface, and general-purpose I/O.

The system uses four types of memory devices in the design—SDRAM, kernel flash, compact flash (user flash), and boot flash. The fabric application and switching section of the system board, the XPath per-port processing ASIC and memory chip sets, the XPath fabric ASIC, and the small form factor pluggable (SFP) media are the key components to provide high-speed data manipulation and movement.

SFP media interface to external devices and support any combination of short wavelength (SWL) and long wavelength (LWL) optical media.

The system chassis is a 2 Unit (U) high enclosure with space to contain two hot-pluggable n+1 power supply units, the motherboard, the control system daughter card, the power regulator board, and dual hot-pluggable fan assemblies.

Port side

The MP Router's port side, shown in Figure 1 and Table 2, includes two 320-watt removable, redundant power supplies with hot-swappable capability, Fibre Channel ports, management ports, and a serial port.

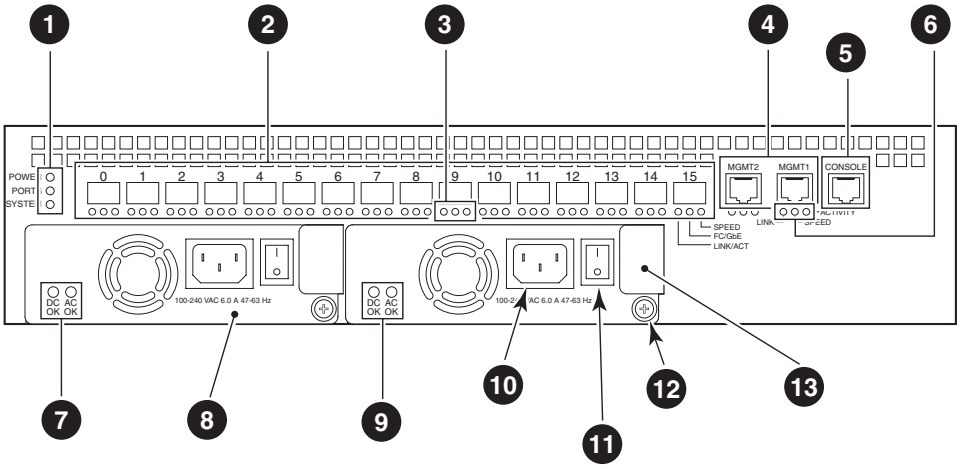

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Figure 1 MP Router (port side)

Table 2 Port side component descriptions

Item	Summary
1 System status LEDs	Indicate overall system status, including ports and power supplies.
2 FC ports (0 through 15)	Full duplex, auto-sensing of 1- and 2-Gb/s port speeds. MP Router Base model ships with eight ports activated. MP Router Full ships with sixteen ports activated.
3 Port status LEDs	Indicate how particular ports are functioning.
4 Management ports (2)	Provides Ethernet ports.
5 Serial port	Provides an RJ-45 connector for setting initial parameters. Connects the console port on the MP Router to an RS-232 port on a computer workstation.

Table 2 Port side component descriptions (continued)

Item	Summary
6 Management port LEDs	Indicate Management port activity including speed and link status.
7 Power supply LEDs	Indicate normal power output or failure.
8 Power supply	Each power supply provides three DC outputs (5V standby, 12V, and 48V), providing a total output power of 320 maximum usable watts.
9 Power supply status LEDs	Indicate power supply input/output functioning properly or alert user to replace a faulty power supply.
10 AC power inlet	Use to connect MP Router power cord.
11 ON/OFF power switch	Use to power on the switch, (part of power supply assembly).
12 Captive screw	Remove to detach a failed power supply.
13 Yellow handle	Pull to release faulty power supply.

Power supplies

The power supply is a hot-swappable Field Replaceable Unit (FRU), allowing n+1 redundant configurations. The unit is a universal power supply capable of functioning worldwide without voltage jumpers or switches. The fully enclosed, self-contained unit integrates internal fans to provide cooling.

The power supply provides three DC outputs (5V standby, 12V, and 48V), providing a total output power of 320 maximum usable watts. Each power supply plugs directly into the enclosure from the port side of the unit, mating to internal blind connectors that connect both the DC outputs and the interface signals to the system backplane. An on/off switch, input filter, and power indicator are provided in each power supply, as well as a serial EEPROM device that provides identifying information.

Multi-protocol ports

The MP Router integrates sixteen multi-protocol ports (numbered 0—15, left to right). If you purchased the MP Router Base model, ports 0—7 are enabled. If you purchased the MP Router Full model, all ports are enabled.

IMPORTANT: If you purchased the MP Router with only eight active ports, you can enable the remaining eight ports by purchasing the HP StorageWorks MP Router Upgrade License. See "Upgrading an 8-port base model to a 16-port full model" on page 19 for more information.

Each multi-protocol port uses an optical SFP. The SFPs are hot-swappable and use industry-standard local channel connectors. Make sure that all installed SFPs are approved for use with the MP Router. To see a list of supported SFPs for your chassis, issue the `sfpSupport` command, or see "MP Router orderable hardware" on page 21.

- In FC mode (the default), each port provides auto-sensing ISL and fabric type (E, F, and FL, respectively) connectivity.
- Additionally, the ports can be configured to provide EX_Port connectivity for use when routing traffic between SANs. To use the ports as EX_Ports, you must manually configure them. See the *HP StorageWorks XPath OS 7.4.x administrator guide* for details about port configuration.
- Optionally, multi-protocol ports can be configured to act as IEEE-compliant optical Gigabit Ethernet (GigE) ports, running at 1 Gb/s. When configured this way, the optional GigE ports are used as part of the FCIP and iSCSI implementation.

Management ports

The MP Router provides dual, fully IEEE-compliant 10/100 BaseT Ethernet ports for management purposes. When a device is connected to the port, both ends negotiate to determine the optimal speed. The Ethernet port uses an RJ-45 connector. There are three externally visible LEDs for each Ethernet port (see "Management port LEDs" on page 55 for additional LED information). One LED indicates link status, one indicates transmit/receive activity, and one indicates speed (10 Mb/s or 100 Mb/s). The TCP/IP address for each port can be configured from the serial port.

Serial port

An RS-232 serial port ships with the MP Router. The serial port uses an RJ-45 connector. The serial port's parameters are fixed at 9600 baud, 8 data bits, and no parity, with flow control set to *None*. The serial port connector is intended for initial IP address configuration only. You can also use the connection to restore the MP Router to its factory default settings, if flash memory contents are "lost."

NOTE: The serial port connector is not intended for everyday administration/maintenance functions.

Nonport side

The MP Router's nonport side, shown in Figure 2 and Table 3, includes dual hot-pluggable cooling fan assemblies with LEDs (containing three fans each) and system status LEDs. The system status LEDs are described in "Interpreting LED activity" on page 51.

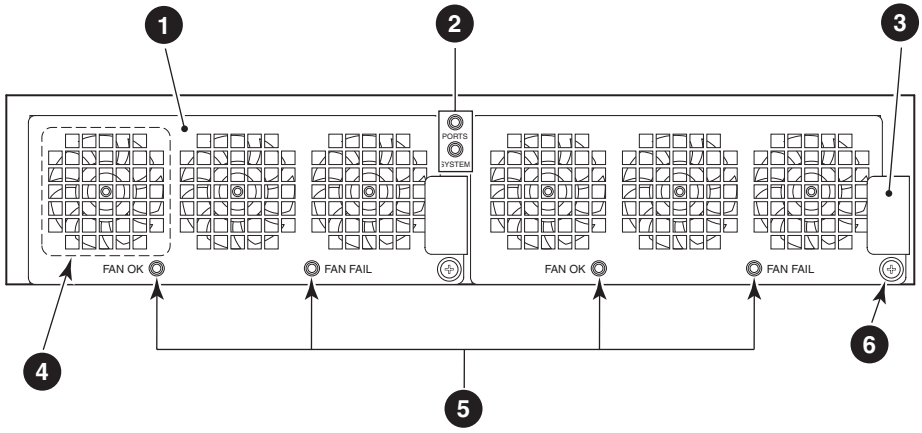

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Figure 2 MP Router (Nonport side)

Table 3 Nonport side component descriptions

Item	Summary
1 Fan assembly (2)	The chassis contains two fan assembly slots. Each fan assembly contains three fans.
2 System status LED	Full duplex, auto-sensing of 1- and 2-Gb/s port speeds.
3 Yellow handle	Pull to release faulty fan assembly.
4 Fan (1 of 6)	Provide cooling for system components.
5 Fan status LEDs	Indicate fan activity or failure. Alerts user to replace a faulty fan assembly.
6 Captive screw	Remove to detach a failed fan assembly.

Software features

XPath OS 7.4.x runs on the MP Router. The firmware provides full Fibre Channel switch capability, FC-FC Routing Service, and Fibre Channel over IP tunneling.

You can configure individual ports on the MP Router to support the switch functionality or services that you need.

Fibre Channel switch support

XPath OS 7.4.x includes the following Fibre Channel features:

- Name Server support
- Zone Server support
- ISL exchange-based trunking

See the *HP StorageWorks XPath OS 7.4.x administrator guide* for additional information on these features.

Multi-protocol SAN routing services

Multi-protocol SAN routing services are available on the MP Router. These services include the FC-FC Routing Service, iSCSI Gateway Service, and the FCIP Tunneling Service.

FC-FC Routing service

The FC-FC Routing Service provides connectivity to devices in different fabrics without merging the fabrics. A major component of this service is the MP Router. It allows data to flow across it while it controls the visibility of devices behind it. FC-FC routing allows the creation of Logical Storage Area Networks (LSANs). An LSAN can span multiple fabrics, allowing Fibre Channel zones to cross physical SAN boundaries without merging the fabrics yet still maintaining access control of the zones. FC-FC routing also allows you to share devices, such as tape drives, across multiple fabrics without the potential administrative problems that sometimes result from merging the fabrics.

See the *HP StorageWorks XPath OS 7.4.x administrator guide* for additional FC-FC routing information.

iSCSI Gateway service

The iSCSI Gateway service provides connectivity to Fibre Channel targets for servers using iSCSI. Servers use an iSCSI adapter or an iSCSI driver and Ethernet adapter to connect to a Fibre Channel fabric over IP. See the *HP StorageWorks XPath OS 7.4.x administrator guide* for additional iSCSI Gateway information.

FCIP Tunneling service

The FCIP Tunneling service enables passive Fibre Channel frames to “tunnel” through TCP/IP networks by encapsulating them in TCP packets and then reconstructing them at the other end of the link.

NOTE: XPath OS supports FCIP only between two MP Routers.

See the *HP StorageWorks XPath OS 7.4.x administrator guide* for additional FCIP Tunneling information.

User interfaces

XPath OS 7.4.x provides both a Graphical User Interface (GUI) application, Advanced Web Tools, and a Command Line Interface (CLI). For information on how to use the GUI, see the *HP StorageWorks XPath OS 7.4.x Advanced Web Tools administrator guide*. For CLI command descriptions, see the *HP StorageWorks XPath OS 7.4.x command reference guide*.

Upgrading an 8-port base model to a 16-port full model

The MP Router is available with either eight ports, 0 through 7 (Base model) or 16 ports 0 through 15 (Full model) activated. If your MP Router shipped with eight active ports, you can activate the remaining eight ports by purchasing and installing the HP StorageWorks MP Router Upgrade License.

NOTE: Check port status to verify whether the license is pre-installed. For example, use the `portshow` command for ports 8 through 15. If the port status output indicates `Started` and `Licensed`, then all 16 ports are activated.

9. If ports 8 through 15 show no License, purchase the HP StorageWorks MP Router Upgrade License from an authorized HP representative.

   Your HP representative requires the MP Router’s World Wide Number (WWN) in order to assign a license key. Enter the `switchshow` command to obtain the WWN of your MP Router.
10. Install the HP StorageWorks MP Router Upgrade License. The license key is a string of approximately 16 uppercase and lowercase letters and digits.
    a. Log in to the MP Router as admin.
    b. Enter the `licenseadd` command, followed by the license key enclosed in quotation marks.

NOTE: Enter the license key into the system exactly as issued. If you enter it incorrectly, the license will not function properly.

Example

```
MPRouter:admin> licenseadd "bQebzbRdScRfc0iK"
License key bQebzbRdScRfc0iK added
```

c. After entering the license key, use the `licenseshow` command to see whether the license is valid.

   If a licensed product is not displayed, the license is invalid.

NOTE: After a license is entered, the licensed product is available immediately; the system does not require a reboot.

11. Configure the inactive ports.

    For example, if you are using the ports for routing and connecting to an edge fabric, use the `portcfgexport` command to configure as EX_Port.

    Use the `portstart` command to start the ports. (This command loads the port code, unlike the `portenable` command, which enables the port laser.) For example:

    ```
    portstart 8-15
    ```

12. Use the `portenable` command to enable the ports. For example:

    ```
    portenable 8-16
    ```

    Optionally, use the `portshow` command to verify the status of the newly activated ports is `Started`.

NOTE: If you remove the HP StorageWorks MP Router Upgrade License, ports 8 through 15 no longer work after the next reboot.

Optional hardware kits

Table 4 lists MP Router optional hardware kits.

Table 4 MP Router orderable hardware

Option	Part number
Short Wave Optical Transceiver	A6515A
10 km Long Wave Optical Transceiver	A6516A
2 m LC-to-LC multimode FC cable	221692-B21
5 m LC-to-LC multimode FC cable	221692-B22
15 m LC-to-LC multimode FC cable	221692-B23
30 m LC-to-LC multimode FC cable	221692-B26
35 km Long Wave Optical Transceiver	300836-B21
50 m LC-to-LC multimode FC cable	221692-B27
2 m LC-to-SC multimode FC cable	221691-B21
5 m LC-to-SC multimode FC cable	221691-B22
15 m LC-to-SC multimode FC cable	221691-B23
30 m LC-to-SC multimode FC cable	221691-B26
50 m LC-to-SC multimode FC cable	221691-B27

2 Installation, setup, and login

This chapter provides the following information:

Unpacking and verifying carton contents

Unpack and inspect the MP Router carton contents as follows.

1. Inspect the shipping carton for possible damage caused during transmit.
2. Unpack the shipping carton.
3. Verify that the carton contains the items listed in Table 5.

NOTE: If any items are damaged or missing, please contact HP or an authorized HP reseller.

Locating MP Router serial numbers

For tracking purposes, locate the MP Router serial numbers on the rear panel, near the fan assemblies. Store in a safe location. Serial numbers are required if you need to contact HP technical support.

Carton contents checklist

Table 5 Shipping carton contents

Item	Description
1	One MP Router populated with two power supplies and two fan assemblies

2	An MP Router product accessories box containing:
	• One RS-232 serial cable; can be converted from a DB-9 to a RJ-45 connector, by removing the adapter on the end of the cable
	• Pouch containing rack mount hardware:
	  • (14) #8-32 x 3/16-inch Phillips pan-head screw with thread lock for the SAN Switch 2/32 only
	  • (14) 8-32 x 5/16-inch Phillips pan-head SEMS screw for use with the MP Router, SAN Switch 2/8, SAN Switch 2/8V, SAN Switch 2/16, SAN Switch 2/16V, or SAN Switch 2/16N
	  • (10) #10-32 x 1/2-inch Phillips pan-head screw with captive star lock washer
	  • (8) #10 alignment washer
	  • (8) #10 adapter washer
	  • (2) 1/4-20 hex nut with captive star lock washer
	  • (2) 1/4-inch flat washer
	• Documentation, license, warranty, and HP StorageWorks Multi-protocol Router Documentation CD/XPath OS 7.4.x (all documents referenced in this document reside on this CD)
	• Two country-specific AC power cords
	• Two Power Distribution Unit (PDU) power cords
	• Four rubber mounting feet for stand-alone installations on a table or lab bench

3	SAN Switch Rack Mount Kit: • Two rear mounting brackets • A right inner rail and a right outer rail • A left inner rail and a left outer rail

Installation guidelines

Install the MP Router using one of the following methods:

- As a stand-alone unit on a flat surface
- In a 19-inch Electronic Industries Association (EIA) rack, using the HP StorageWorks SAN Switch Rack Mount Kit (included with the MP Router)

CAUTION: To ensure adequate cooling, install the chassis with the nonport side facing the air-intake aisle. This prevents the fans from pulling in heated exhaust air.

Review these guidelines to ensure correct installation and operation:

- Provide a space that is 2 rack units (2U) high (3.5 inches; 8.9 cm), 19 inches wide (48.3 cm), and at least 28 inches deep (71.1 cm).
- Position the MP Router with the nonport side facing the air-intake (cool) aisle.
- Plan for cable management before installing the MP router. See "Recommendations for cable management" on page 40.

NOTE: If the cables will be routed below the chassis, leave a minimum of 3U of space below the chassis.

- Verify that two dedicated electrical branch circuits with the following characteristics are available:
  - 100 to 240 VAC, 47 to 63 Hz
  - Circuit breaker protection in accordance with local electrical codes
  - Supply circuit, line fusing, and wire size adequate to the electrical rating on the chassis nameplate
  - Location close to the MP Router chassis, which is easily accessible
  - Grounded outlets installed by a licensed electrician, which are compatible with the power cords

NOTE: To maximize fault tolerance, connect each power cord to a separate power source.

- Verify that the MP Router fans have access to a total minimum air flow of 47 cubic feet per minute (79.8 cubic meters per hour).
- Verify that the air intake and exhaust vents have a minimum of 2 inches of airspace.
- Ensure that the air temperature on the air intake side is less than 104° Fahrenheit (40° Celsius) during operation.

Installation time and items required

Table 6 lists the main installation and setup tasks and the estimated time and items required for each task. The time estimates assume a prepared installation site and appropriate power and network connectivity.

Table 6 MP Router installation tasks

Installation task	Time estimate	Items required
Unpacking the MP Router	15 minutes	Exacto knife or other sharp object to remove the shipping tape
Installing HP StorageWorks SAN Switch Rack Mount Kit	30 minutes	See *"Installing the MP Router in a rack using the SAN Switch Rack Mount Kit" on page 28*
Installing power cables and serial cable and configuring IP addresses	15 minutes	Power cables and serial cable (provided in the MP Router accessory kit) Workstation computer with a serial port or terminal server port and a terminal emulator application (such as HyperTerminal) Ethernet IP address for the MP Router
Installing Ethernet cable and configuring the router name, policies, domain ID, PIDs, or additional system parameters	20 minutes	Ethernet cabling (optional) for telnet access
Installing SFP optical transceivers	10 minutes	SFP optical transceivers (not included with MP Router; purchase separately; see Table 4 on page 21).
Attaching fiber optic cables and cable guides	15 minutes	Fiber optic cables and cable guides

Setting up the MP Router as a stand-alone unit

Follow this procedure to set up the router as a stand-alone unit. The following items are required for this setup.

- MP Router
- AC power cords and cables supplied with the router
- Rubber mounting feet supplied with the router

1. Place the MP Router on a flat, sturdy surface such as a table or lab bench.
2. Apply the rubber feet as follows:
   a. Clean the four depressions located at each corner of the bottom of the router to ensure they are free of dust.
   b. Place a rubber foot in each depression, with the adhesive side against the chassis, and press into place.

CAUTION: HP recommends installing the rubber feet on the router to help prevent the router from accidentally sliding off the table or bench.

3. Connect the power cables to the MP Router power connectors and to a power outlet. Ensure the power cable is routed so that it is not exposed to stress.
4. Turn on both MP Router power switches (position each AC switch to `1`).

   The router automatically runs a Power On Self-Test (POST).

CAUTION: Do not connect the router to the network until the IP address is correctly set. For instructions on how to set the IP address, see "Logging into the MP Router via a serial connection" on page 41.

Installing the MP Router in a rack using the SAN Switch Rack Mount Kit

This section provides instructions for installing the MP Router in an HP System/e rack, or in an HP 10000 series rack using the HP StorageWorks SAN Switch Rack Mount Kit supplied with your router. This installation requires one technician.

The following items are required to install the router in a rack:

- MP Router
- Power cables
- #2 Phillips screwdriver
- 7/16-inch wrench or socket

The SAN Switch Rack Mount Kit rails and rail mounting hardware are listed in Table 7.

Table 7 Rack Mount Kit rails and rail mounting hardware

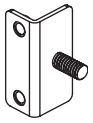
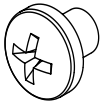
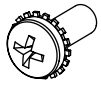
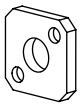
Item	Description
	(2) rear mounting brackets
	A right inner rail and a right outer rail
	A left inner rail and a left outer rail
	(14) #8-32 x 3/16-inch Phillips pan-head screws with thread lock for the SAN Switch 2/32 only.
	(14) 8-32 x 5/16-inch Phillips pan-head SEMS screws for use with the MP Router (requires six, three on each side, to attach right and left rails)
	(10) #10-32 x 1/2-inch Phillips pan-head screws with captive star lock washer

Table 7 Rack Mount Kit rails and rail mounting hardware (continued)

Item	Description
	(8) #10 alignment washers
	(8) #10 adapter washers
	(2) 1/4-20 hex nuts with captive star lock washers
	(2) 1/4-inch flat washers

CAUTION: For proper air flow, the SFP media side of the MP Router must face the rear of the rack. This mounting allows air to enter from the front of the rack and to exhaust at the rear of the rack, similar to other rack-mounted equipment. This prevents overheating, which can cause failures.

To install the router in a rack:

1. Check the contents of the shipping carton to verify that all the required parts and hardware are available.
2. Choose a mounting location in the rack for the router.
3. Attach the rear mounting brackets to the rear rack uprights by completing one of the following steps:

- For an HP 10000 series rack, assemble each of the two brackets with two #10-32 x 1/2-inch Phillips pan-head screws with captive star lock washers and two #10 adapter washers as shown in Figure 3.

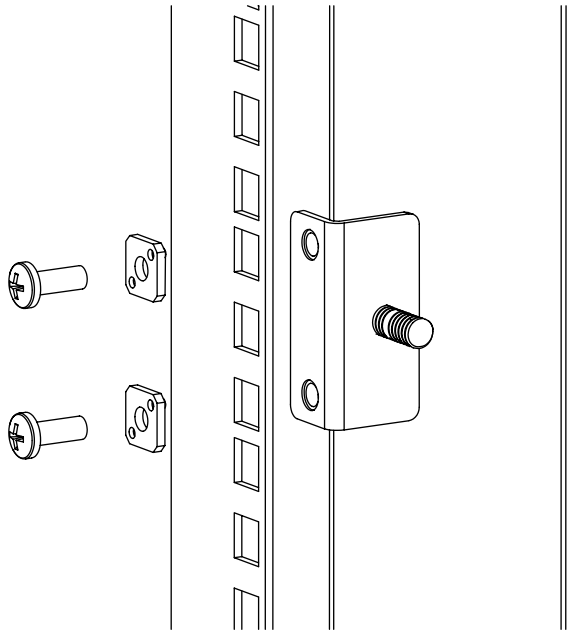


Figure 3 Installing the rear mounting brackets (HP 10000 Series Rack)

- For an HP System/e rack, install each of the two rear mounting brackets with two #10-32 x 1/2-inch Phillips pan-head screws and two #10 alignment washers as shown in Figure 4.

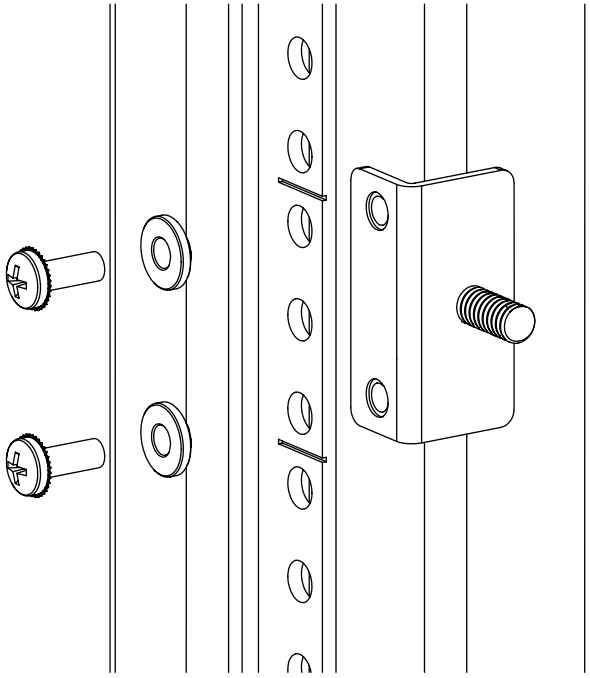


Figure 4 Installing the rear mounting brackets (HP System/e rack—left rear upright)

NOTE: This kit contains both left rails and right rails. The rails are labelled `Right` and `Left`.

4. Assemble the outer rails by completing the following steps:
   a. Attach the left outer rail and the right outer rails to the rear mounting brackets using two 1/4-20 hex nuts with captive star lock washers. Attach the hex nuts loosely (as shown in Figure 5). Do not tighten; tighten the hex nuts later in step 7 on page 37.

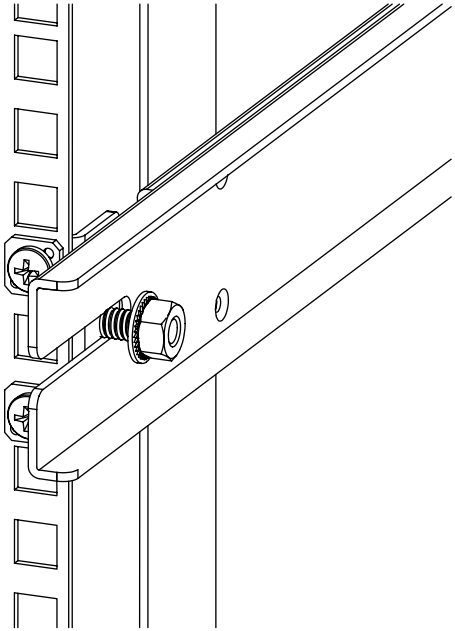


Figure 5 Installing the outer rails (HP 10000 Series Rack)

b. Depending on the rack you are using, complete one of the following tasks:

- For an HP 10000 series rack, install two #10-32 x 1/2-inch Phillips pan-head screws with captive star lock washers and two #10 adapter washers in the upper and lower hole locations of the right rail. Then install two #10-32 x 1/2-inch Phillips pan-head screws with captive star lock washers and two #10 adapter washers in the upper and lower hole locations of the left rail, as shown in Figure 6.

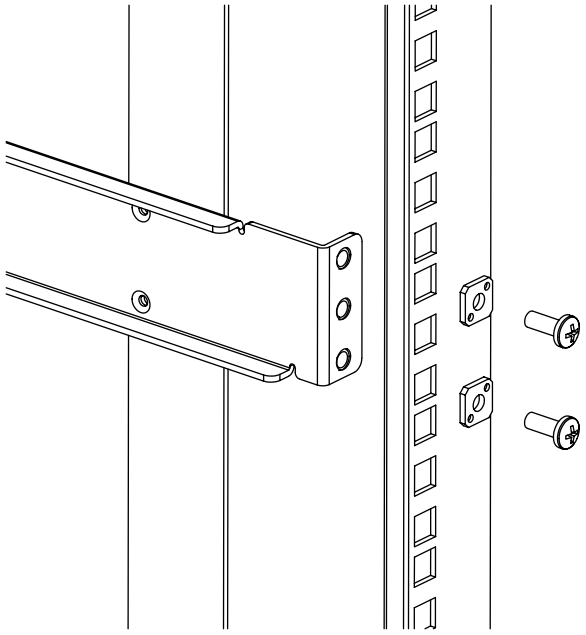


Figure 6 Assembling the outer rails

- For an HP System/e rack, install two #10-32 x 1/2-inch Phillips pan-head screws with captive star lock washers and two #10 alignment washers in the upper and lower hole locations of the right rail. Then install two #10-32 x 1/2-inch Phillips pan-head screws with captive star lock washers and two #10 alignment washers in the upper and lower hole locations of the left rail, as shown in Figure 7.

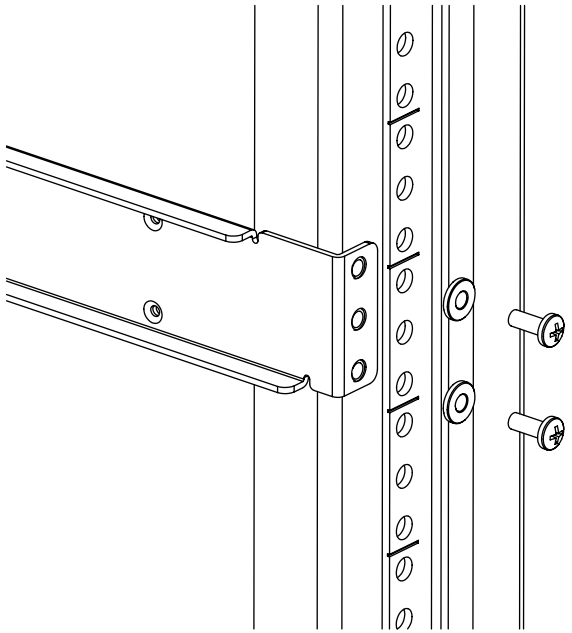


Figure 7 Assembling the outer rails (HP System/e Rack)

CAUTION: Do not use any screws other than the fourteen that are provided. Using longer screws can cause damage to internal components.

5. For both HP 10000 series and HP System/e racks, use the mounting holes shown in Figure 8 to attach the two inner rails (one on each side) to the MP Router. Use six screws (three on each side) of the 8-32 x 5/16-inch Phillips pan-head SEMS screws as shown in Figure 8.

   When viewing a rack from the front, the left rails are used in the left side of the rack and the right rails are used in the right side of the rack. The rails must match up—right inner with right outer and left inner with left outer. Note that the MP Router mounts in the rack with its front, the port side, facing the back of the rack. The rear of the router, the AC side, faces the front of the rack.

NOTE: The rail kit provides fourteen #8-32 x 5/16-inch Phillips pan-head SEMS screws for assembling the inner rails onto HP StorageWorks devices. Each device requires a different number of these screws. For example, Figure 8 shows an inner rail being attached to the MP Router with three screws. Attaching both inner rails requires six screws.

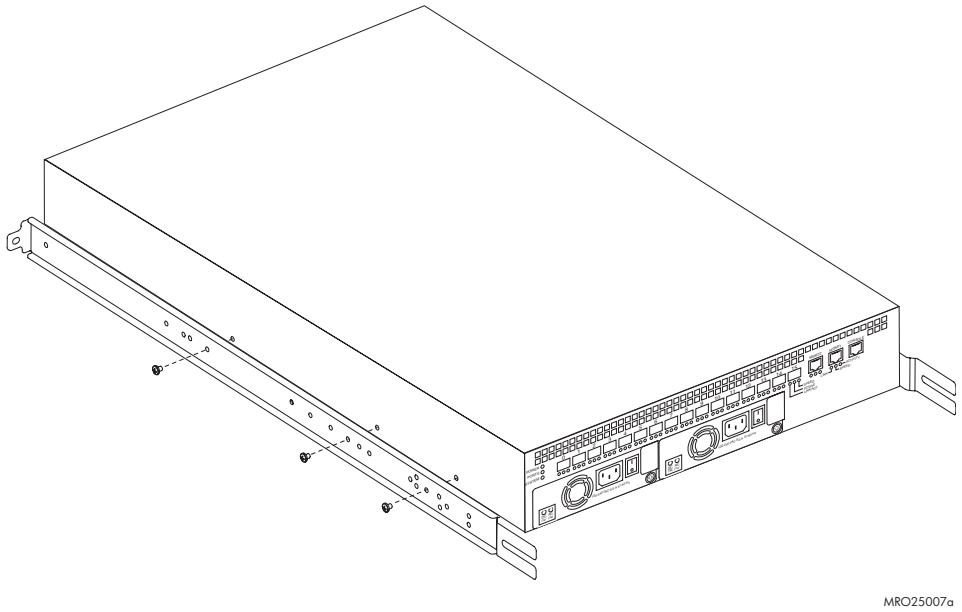


Figure 8 Attaching the rails to the MP Router

NOTE: This step applies to both the HP 10000 series and HP System/e rack.

6. Insert the router into the rack and install two #10-32 x 1/2-inch Phillips pan-head screws with captive star lock washers, one on each side, as shown in Figure 9 and Figure 10.

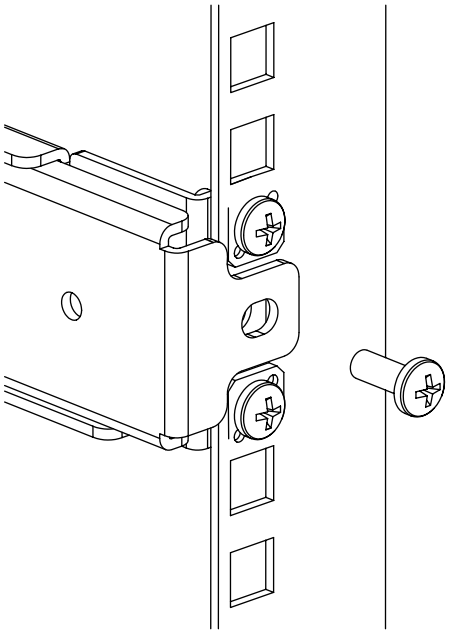


Figure 9 Securing the MP Router to a rack (HP 10000 Series rack)

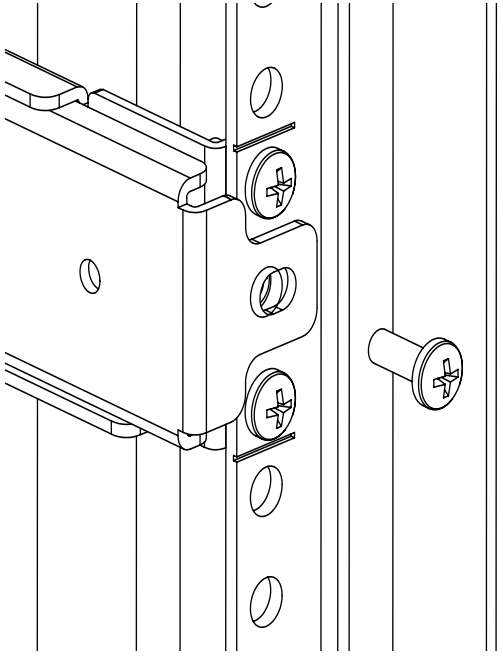


Figure 10 Securing the MP Router to a rack (HP System/e rack)

7. Tighten the nuts installed in step 4a on page 32.

NOTE: To uninstall a router, remove the middle #10-32 x 1/2-inch Phillips pan head screw with captive star lock washer from either side of the rack uprights.

Connecting AC power

Follow these steps to power on the MP Router.

CAUTION: Do not plug the power cords into the power source until the MP Router is completely installed in the rack.

1. Connect the two MP Router power cords to the power inlets on the switch.
   Verify that each power cord has a minimum service loop of 6 inches available at the connection to the switch and is routed so that it is not exposed to stress.
2. Connect the remaining ends of the power cords to a power source with voltage of 100 to 240 VAC, 47 to 63 Hz.

NOTE: To protect against AC failure, connect the power cords to outlets on separate circuits if possible.

3. Turn on each power switch (the `1` position indicates power on, the `O` position indicates power off).
   The MP Router automatically runs POST each time it is powered on. POST requires at least 3 minutes to complete.
4. Verify that the power LED on the port side of the MP Router, shown in Figure 11, is green.

CAUTION: To prevent a potential IP address conflict, do not connect the MP Router to the network until the IP address is correctly set. For instructions on setting the IP address, see "Logging into the MP Router via a serial connection" on page 41.

Power On Self-Test

Each time the router is powered on, rebooted, or reset, it automatically runs POST. During POST, the port status LEDs flash, verifying that the router is operating properly. POST completes in approximately 3 minutes, with a total boot time of approximately 6 minutes.

POST runs through the following test cycles:

- Preliminary POST diagnostics
- Initialization of operating system
- Initialization of hardware
- Diagnostic tests, which are run on a number of functions, including circuitry, port functionality, memory, parity, statistics counters, and serialization

If the prompt does not appear when POST completes, POST was unsuccessful. Contact your HP- authorized reseller for more information.

To determine whether POST completed without errors, verify that all LEDs return to a normal state after POST is complete. If one or more LEDs do not return to a normal state. see "Checking POST results" on page 39.

Bypassing POST

POST is organized into two groups: POST1 and POST2. POST1 cannot be bypassed and runs from the boot loader.

The factory default configuration is set to run POST2, but you can configure your system to bypass it.

NOTE: Although each test performed during POST2 is configurable, you should only modify a POST2 test if directed by an authorized HP technician.

Use the `diagdisablepost` command to disable POST2. To re-enable, use the `diagenablepost` command. See the *HP StorageWorks XPath OS 7.4.x command reference guide* for additional information about these commands.

The following example shows a typical boot sequence, including POST messages.

Example

```
*********************************************************************************
*                                                                               *
* Copyright (c) 2004, *
* MP Router*
* Firmware Version 1.x.x.x.H  build  #XX: Sat Jan 31 12:40:41 PDT 2004 *
* MAC Address: 00:05:1E:31:2F:60                                                *
* BCSR FPGA Version 2007                                                        *
*                                                                               *
*********************************************************************************

1024 MB SDRAM installed
Executing code from SDRAM at 0203B5E0
Power supply 1 status test PASSED
Power supply 2 status test FAILED
Fan tray status 1 test PASSED
Fan tray status 2 test PASSED
SEPROM initialized. SEPROM test is BYPASSED
Dram test #2 is BYPASSED
Compact Flash is installed


Autoboot command: "memboot"
Press <Enter> to execute or any other key to abort.
```

After POST2 completes, various system services start and the boot process displays additional console status and progress messages. The messages are specific to the fabric, the MP Router, and the software release.

NOTE: For more information about beaconing, see the *HP StorageWorks XPath OS 7.4.x administrator guide*.

Checking POST results

Check the success/fail results of the diagnostic tests run during POST via LED activity, the error log, or CLI using the `errShow` command. For more information about error messages, see the *HP StorageWorks XPath OS 7.4.x diagnostic and system error messages reference guide*.

Recommendations for cable management

Follow these suggestions for better cable organization and management:

- Plan cable management before installing the MP Router to ensure adequate rack space.
- Leave at least one meter of slack for each port cable. This provides room to remove and replace the MP Router, allows for inadvertent rack movement, and helps prevent the cables from being bent to less than the minimum bend radius.
- Label the fiber optic cables and record the devices to which they are connected for easier maintenance.
- Keep LEDs visible by routing port cables and other cables away from the LEDs.
- Do not use tie wraps on fiber optic cables. Tie wraps can damage the optic fibers.

CAUTION: A fiber-optic cable should not be bent to a radius less than 2 inches under full tensile load and 1.2 inches with no tensile load.

Installing SFP transceivers

Use the following procedure to connect the SFPs and cables to MP Router ports as required.

NOTE: The ports and cables used in trunking groups must meet specific requirements. For a list of these requirements, see the *HP StorageWorks XPath OS 7.4.x administrator guide.*

1. Identify the ports to connect to the fabric.
2. Remove the shipping plug from the appropriate ports.
3. Position the SFP so that the key (the tab near the cable-end of the SFP) is on top.

NOTE: The SFP is keyed so that it can be inserted only with the correct orientation into the port. If the SFP does not slide in easily, check the orientation

4. Insert the SFP into the port until it is firmly seated and the latching mechanism clicks.

5. Connect the cables to the SFPs:

CAUTION: A 50-micron cable should not be bent to a radius less than 2 inches under full tensile load and 1.2 inches with no tensile load. Tie wraps are not recommended for optical cables because they are easily overtightened.

   a. Orient a cable connector so that the key (the ridge on one side of the connector) aligns with the slot in the SFP.
   b. Insert the cable into the transceiver until the latching mechanism clicks (see Figure 15 on page 74).

   The cable connectors are keyed to ensure correct orientation. If a cable does not install easily, check the orientation.

   For instructions specific to the cable type, see the cable manufacturer's documentation.

6. Repeat step 5 for each remaining SFP.

Logging into the MP Router via a serial connection

The initial connection to the MP Router requires a serial connection. Follow these steps to establish a serial connection and log in to the MP Router:

1. Verify that the MP Router is powered on and that POST is complete by verifying that all power LED indicators are displaying a steady green light. See Figure 11 on page 52and Figure 12 on page 56 for power LED locations.
2. Use the serial cable included in the MP Router shipping carton to connect the console port on the chassis to an RS-232 port on a computer workstation.

NOTE: If necessary, the adapter on the serial cable can be removed to allow for an RJ-45 serial connection to the computer workstation or patch panel.

3. Access the MP Router using a terminal emulator application (such as HyperTerminal on Windows 95, Windows 2000, or Windows NT®, or TERM in a UNIX® environment).
4. Disable any serial communication programs running on the workstation (such as synchronization programs).
5. For a Windows environment, use HyperTerminal (or a similar application), to configure the port settings as follows:
   - Bits per second: 9600
   - Databits: 8
   - Parity: None
   - Stop bits: 1
   - Flow control: None
6. To configure port settings in a UNIX environment, enter:

   tip /dev/ttyb -9600

7. When the terminal emulator application stops reporting information, press **Enter**.
8. Log in to the MP Router as admin. The default password is password.

   At the initial login, you are prompted to enter your own personal admin and user passwords.
9. Modify passwords, if desired.

   Passwords can be 8 to 40 characters and should include a combination of numbers and upper and lowercase letters. To skip this step, press **Ctrl-C**.

Example

```
XPath OS

Switch login: admin
Password:
Please change your passwords now.
Use Control-C to exit or press 'Enter' key to proceed.

Password was not changed. Will prompt again at next login
until password is changed.
Switch:admin>
```

See "Setting initial parameters" on page 43 to finish configuring the MP Router.

3 Setting initial parameters

This chapter provides the following information:

NOTE: This chapter provides the basic steps required for the initial configuration of the MP Router. For comprehensive instructions about configuring the MP Router to operate in a network and fabric—including a fabric containing switches from other vendors—see the *HP StorageWorks XPath OS 7.4.x administrator guide*.

First time configuration checklist

Complete the initial configuration tasks.

1. Set up the IP address. See "Setting the IP address" on page 43.
2. Optionally, establish an Ethernet connection. See "Establishing an Ethernet connection" on page 45.
3. Optionally, specify the domain ID. See "Setting the domain ID" on page 45.
4. Set the date and time. See "Setting the date and time" on page 46.
5. Connect to the fabric and establish fabric parameters. See "Connecting the MP Router to the fabric" on page 48.
6. Enable software licenses, as necessary. See "Viewing, adding, and removing licenses" on page 48.
7. Verify that the MP Router is configured properly. See "Verifying operation" on page 50.
8. Back up the configuration. See "Backing up the configuration" on page 50.

Setting the IP address

After establishing a serial connection (see "Logging into the MP Router via a serial connection" on page 41) use these steps to set the IP address.

1. Log in as admin.
2. Type the `ipAddrSet` command.

See Table 8 for a list of syntaxes to use with the `ipAddrSet` command.

Example

```
APswitch:admin> ipaddrset
usage: ipaddrset <mgmt interface num> [-i ipAddress] [-n netmask]
[-g gateway] [-a action] [-s] [-r]
where mgmt interface num is either 1 or 2, action is either "cfgnow" or
"cfgafterreboot,"
-s option sets the switch virtual IP as same as the IP of the management
interface,
and -r option resets IP configuration of the management interface
APswitch 1:admin>
```

Table 8 `ipAddrSet` command syntax

Variable	Description
mgmt interface num	Specifies the management Ethernet port number (either 1 or 2)
-i ipAddress	Sets the IP address*
-n netmask	Sets the netmask*
-g gateway	Sets the gateway*
-a action	Specifies whether the change is to take place immediately (using the `cfgnow` command) or after the next reboot (using the `cfgafterreboot` command)
-s	Specifies whether the virtual IP address and netmask should match the new IP address and netmask
-r	Resets the IP configuration of the management interface
***NOTE**: These variables use the standard aa.bb.cc.dd format.	

For example, to set the IP address as 192.168.10.1, netmask 255.255.255.0, and gateway 192.168.10.2, type:

```
ipaddrset 1 –i 192.168.10.1 –n 255.255.255.0 –g 192.168.10.1 -a “cfgnow”
```

3. Enter the `ipaddrshow` command to verify that the IP address was set correctly.
4. Remove the serial cable and replace the protective shipping plug if the console port is no longer required.

CAUTION: The console port can be used to monitor error messages through a serial connection. It is not recommended as a command interface during normal operation. If this port is not in use, remove the serial cable and protect the port from dust by replacing the shipping plug.

Record the IP address on the label affixed to the MP Router.

Establishing an Ethernet connection

After using a serial connection to configure the IP address for the MP Router, connect to the Local Area Network (LAN) if desired.

NOTE: HP recommends connecting the MP Router to a private network or VLAN.

By establishing an Ethernet connection, you can complete the MP Router configuration using either a serial session or a telnet session. However, you must ensure that the MP Router is not modified from other connections at the same time.

To establish an Ethernet connection to the MP Router, follow these steps:

1. Insert one end of an Ethernet cable into a management port, as shown in Figure 11 on page 52.
2. Connect the other end to the workstation (or to an Ethernet network containing the workstation).
   As a result, the MP Router can be accessed remotely using any available management tool (such as telnet or Advanced Web Tools). Ensure that the MP Router is not being modified from any other connections during the configuration process.
3. Complete any additional MP Router configuration procedures through a telnet session.
   Log in to the router by telnet, using the admin login. The default password is password.

Setting the domain ID

Each router in the fabric must have a unique domain ID. You can set the domain ID using the `configure` command, or allow the domain ID to be automatically set.

NOTE: The default domain ID for the MP Router is 100.

To set the domain ID, follow these steps.

1. Enter the `switchdisable` command to disable the MP Router.
2. Enter the `configure` command.
3. Enter a unique domain ID.

Example

```
Domain: (1..239) [100] 3
```

4. Enter the appropriate parameters for the remaining prompts.
5. Enter the `switchenable` command to re-enable the MP Router.

Setting the date and time

The MP Router maintains the current date and time in nonvolatile memory. The date and time are used for logging events. Set the correct date and time (and time zone) for the MP Router to prevent management interfaces, such as Advanced Web Tools, from displaying incorrect event times.

Additionally, you can synchronize the local time of the Principal or Primary Fabric Configuration Server (FCS) switch to an external NTP server using the `tsclockserver` command.

NOTE: The `date` and `tsclockserver` commands are disabled when the security feature is enabled. With security enabled you can only view the current date setting unless the commands are performed on the primary FCS switch.

To set the date and time of the MP Router:

1. Log in to the MP Router as admin.
2. Enter the `date` command, including values for the century, year, month, date, hour, minute, and second.

Example

```
date CCYYMMDDhhmm.ss
```

Example

```
APswitch:admin> date 200402091106.59
Mon Feb 09 11:06:59 GMT 2004
APswitch:admin>
```

If the time of MP Router is off by hours (rather than minutes), set its time zone.

1. Log in to the MP Router as admin.
2. Enter the `timezoneset` command.

   An interactive menu appears, from which you can select your time zone.
3. Select the continent or ocean that is closest to the location of the MP Router.
4. Select the country or city time zone that corresponds to the location of the MP Router.

Example

```
APswitch:admin> timezoneset
Please select a continent or ocean
 1). Africa           2). America          3). Antarctica       4). Arctic Ocean
 5). Asia              6). Atlantic Ocean    7). Australia         8). Europe
9). Indian Ocean     10). Pacific Ocean    11). US               12). Canada

Enter the option #: 11

Please select a country or city
 1). Alaska            2). Aleutian          3). Arizona           4). Central
5). East-Indiana      6). Eastern           7). Hawaii 8). Indiana-Starke
 9). Michigan        10). Mountain         11). Pacific         12). Pacific-New
13). Samoa
Enter the option #: 12

time zone is set
APswitch:admin>
```

Synchronizing the local FCS switch to an external NTP server

To synchronize the local time of the Primary FCS switch to an external NTP server, follow these steps.

1. Log in as admin.
2. Enter the `tsclockserver` [`ipaddr`] command.

NOTE: `ipaddr` is the IP address of the NTP server. The IP address specified should be the IP address of an NTP server and should be accessible from the router. This operand is optional; by default this value is LOCL.

Example

```
switch:admin> tsclockserver
LOCL
switch:admin> tsclockserver "132.163.135.131"
switch:admin> tsclockserver
132.163.135.131
switch:admin>
```

Connecting the MP Router to the fabric

Before connecting the MP Router to the fabric, install the SFP transceivers (see "Installing SFP transceivers" on page 40). Verify that all the switches in the fabric use the correct port identifier (PID) settings.

For complete information on setting the PID settings, see the *HP StorageWorks XPath OS 7.4.x administrator guide*.

Use these steps to connect the MP Router to the fabric.

1. Check the MP Router for system and port status by entering the `switchshow` command at the prompt.

   The `switchshow` command provides detailed information about the MP Router. For more information about this command, see the *HP StorageWorks XPath OS 7.4.x command reference guide*.
2. Enter `fabricshow` to check the fabric for ISLs, switch names, or other status.

   The `fabricshow` command provides general information about the fabric. For details about this command, see the *HP StorageWorks XPath OS 7.4.x command reference guide.*
3. To establish additional system parameters, use the `configure` command.

Viewing, adding, and removing licenses

Obtain the MP Router's World Wide Number (WWN) to view and activate licenses.

NOTE: Enter `switchshow` to display the WWN.

See the following sections for information about viewing the current licenses, adding a license, or removing a license:

- Viewing current licenses, page 48
- Adding a license, page 49
- Removing a license, page 50

Viewing current licenses

Use these steps to view the licenses enabled on the MP Router.

1. Log in to the MP Router as admin.
2. Enter the `licenseshow` command.

   A list of the enabled licenses appears.

Example

```
APswitch:admin> licenseshow
License Key: bQebzeRdScRfc0iK
        Web

License Key: SybbzQQ9edTzcd0X
        Zoning

License Key: SybbzQQ9edTzcc0X
        Trunking

License Key: cSzbbcdyQbdb0csv
        FCIP

APswitch:admin>
```

Adding a license

Contact your HP-authorized reseller to purchase license keys for optional features. A license key is a string of approximately 16 uppercase and lowercase letters and digits.

Your HP representative requires the MP Router's World Wide Number (WWN) in order to assign a license key. Enter the `switchshow` command to obtain the WWN of your MP Router.

After obtaining the license key, use these steps to add a license.

1. Log in to the MP Router as admin.
2. Enter the `licenseadd` command, followed by the license key enclosed in quotation marks.

NOTE: Enter the license key into the system exactly as issued. If you enter it incorrectly, the license will not function properly.

Example

```
APswitch:admin> licenseadd "bQebzbRdScRfc0iK"
License key bQebzbRdScRfc0iK added
```

3. Use the `licenseshow` command to check to see whether the license is valid.
   If a licensed product is not displayed, the license is invalid.

NOTE: After you enter a license, the licensed product is available immediately. The system does not require a reboot.

Removing a license

Use these steps to remove a license from the MP Router.

1. Log in to the MP Router as admin.
2. Enter the `licenseremove` command, followed by the license key enclosed in double quotation marks.

Example

```
APswitch:admin> licenseremove "bQebzbRdScRfc0iK"
removing license key "bQebzbRdScRfc0iK"
```

3. Remember to save the license key in case you want to reinstall the license in the future.

Verifying operation

Use these steps to verify that the MP Router is set up and connected.

1. Check the LEDs to verify that all components are functional.
2. Enter `switchshow` to display the MP Router system and port status.
3. Enter `fabricshow` to display general information about the fabric.

Backing up the configuration

Save all configuration data for the MP Router—including license key information—and upload it to a host for emergency reference. Back up the configuration on a routine basis to ensure that the current configuration is available.

Back up the configuration by entering the `configupload` command.

The `configupload` command uploads the MP Router configuration to the server so that it is available for downloading to a replacement MP Router, if necessary. For more information about this command, see the *HP StorageWorks XPath OS 7.4.x command reference guide*.

4 Monitoring the MP Router

This chapter provides the following information:

NOTE: You can also set up monitoring alerts using SNMP, syslog, or software features like Advanced Web Tools. See the *HP StorageWorks XPath OS 7.4.x Advanced Web Tools administrator guide* and the *HP StorageWorks XPath OS 7.4.x administrator guide* for additional information.

Interpreting LED activity

MP Router status is determined through the LED activity. There are three possible LED states: no light, a steady light, and a flashing light. The lights may be any of the following colors:

- Green
- Orange (may be referred to as *amber* in related documentation)
- Yellow (appears when both green and orange LED elements are lit)

NOTE: Any errors related to LED activity are listed in the error log. For information about the error log, see the *HP StorageWorks XPath OS 7.4.x administrator guide*.

Port side LEDs

The LEDs on the port side of the MP Router provide information about the overall system status, the Fibre Channel ports, the management ports, and the power supplies as shown in Figure 11 and Table 9.

The LED patterns might temporarily change during POST and other diagnostic tests. For information on interpreting LED patterns, see the following sections:

- System status LEDs—port side, page 53
- Multi-protocol port LEDs, page 54
- Management port LEDs, page 55
- Power supply LEDs, page 55

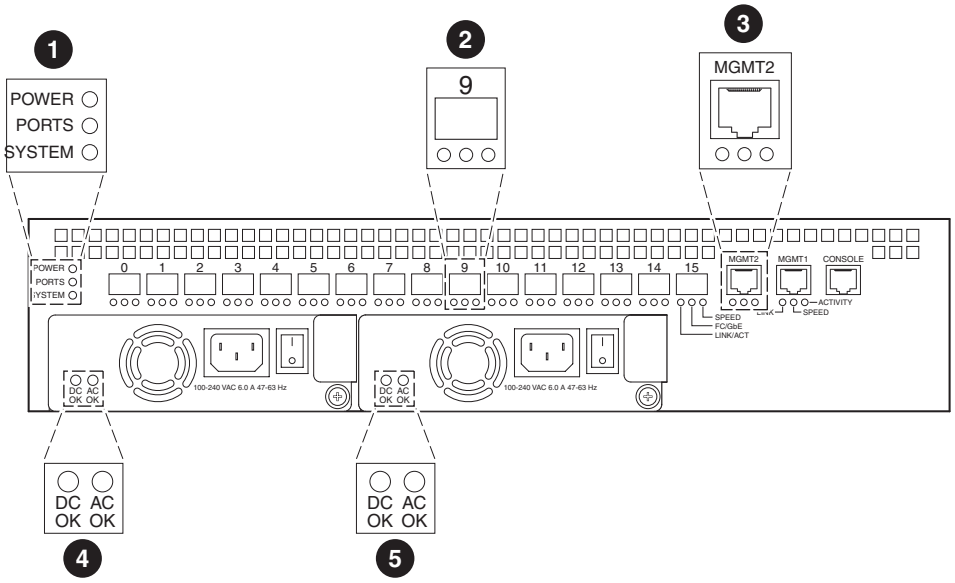


Figure 11 Port side LEDs

Table 9 Port side LEDs descriptions

Item	Component
1	System status LEDs
2	Port status LEDs
3	Management port LEDs
4	Power supply 1 status LEDs
5	Power supply 2 status LEDs

System status LEDs—port side

The system status LEDs on the port side of the MP Router indicate system status. See Table 10 for a description of the system status (port side) LEDs.

There are also system status LEDs on the nonport side of the MP Router.

Table 10 System status LEDs (port side)

LED Label	LED color	Indication
System	Off	System initializing (or power is off).
	Green	System status is good.
	Yellow	System or FRU fault(s) detected.
	Yellow (blinking)	Beacon is on.
Ports	Off	System initializing (or power is off).
	Green	Port status is good.
	Yellow	Port fault(s) detected.
Power	Green	Power is on.

Multi-protocol port LEDs

The three LEDs beneath each multi-protocol port, as shown in Figure 11, indicate how that particular port is functioning. Interpreting the status of an individual port requires the combination of each of its three LEDs. See Table 11 for a description of the multi-protocol port LEDs.

Table 11 Multi-protocol port LEDs

Indication	**LED label**		
	Link/Act	**FC/GbE**	**Speed**
Default or Configured foruration indicator	Off	Configured for FC mode = green Configured for GbE mode = yellow	Configured for for auto-negotiate = off Configured for for fixed 2Gb/s = green Configured for for fixed 1Gb/s = off
FC receiving light, but not online	Off	Green (continuous)	2Gb/s = green 1Gb/s = off
FC link up, but no traffic	Green (continuous)	Green (continuous)	
FC traffic	Green (flashing)	Green (continuous)	
FC E_Port segmented	0.5 Hz Green (flashing)	0.5 Hz yellow (flashing)	
FC port disabled	Off	0.25 Hz yellow (flashing)	
FC port (multiple loop targets detected when not permitted)	Green (continuous)	1 Hz alternating green/yellow (flashing)	
GbE receiving light, but not online	Off	Yellow (continuous)	
GbE link up, but no traffic	Green (continuous)	Not applicable	
GbE traffic	Green (flashing)	Not applicable	
GbE port disabled (not implemented)	Not applicable	Not applicable	Not applicable
Port error*	Off	Yellow (continuous)	Yellow (continuous)
***NOTE:** In this state, the port with problems is signified by yellow (flashing) LEDs.			

Management port LEDs

The three LEDs beneath each of the management ports, as shown in Figure 11, indicate port status. See Table 12 for a description of the management port LEDs.

Table 12 Management port LEDs

LED label	LED color	Indication
Link	Off	No link status
	Green (continuous)	Link up
Speed	Off	10 Mb/sec data rate
	Green (continuous)	100 Mb/sec data rate
Activity	Off	No activity
	Green (flashing)	Each blink is a measure of activity

Power supply LEDs

The power supply LEDs on each power supply, as shown in Figure 11, indicate power supply status. See Table 13 for a description of the power supply LEDs.

Table 13 Power supply LEDs

LED Label		Indication
DC OK	AC OK	
On (green)	On (green)	Normal operation
Off	On (green)	DC output failure
Off	Off	AC failure or no input power

Nonport side LEDs

The LEDs on the nonport side of the MP Router provide information about the overall system status and the fan assemblies, as shown in Figure 12 and Table 14.

The LED patterns might temporarily change during POST and other diagnostic tests. For information on interpreting LED patterns, see the following sections:

- System status LEDs—nonport side, page 57
- Fan status LEDs, page 57

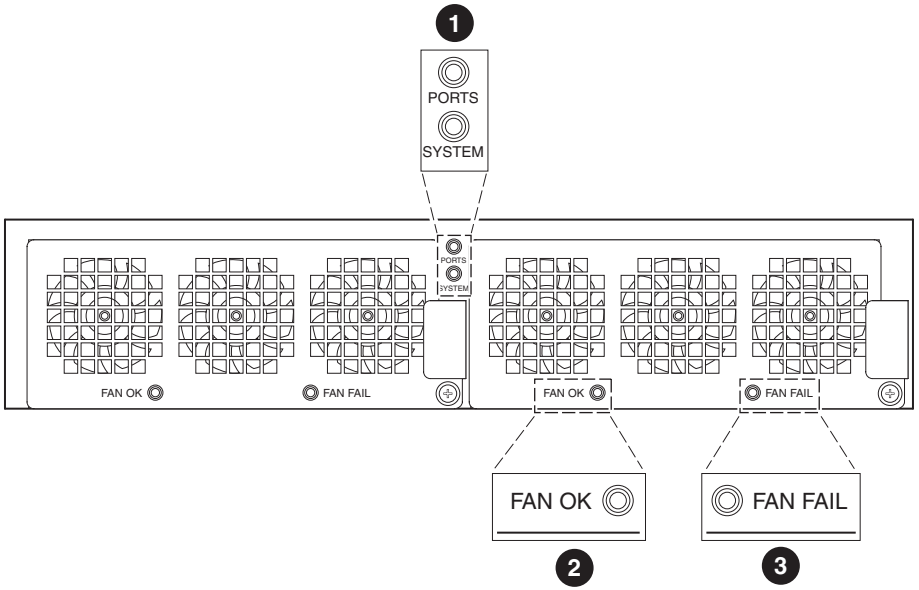


Figure 12 Nonport side LEDs

Table 14 Nonport side LEDs descriptions

Item	Component
1	System status LEDs
2	Fan status LED
3	Fan fail status LED

System status LEDs—nonport side

The system status LEDs on the nonport side of the MP Router, as shown in Figure 12, indicate system status. See Table 15 for a description of the system status (nonport side) LEDs. There are also system status LEDs on the port side of the MP Router. See Figure 11 for their location and Table 10 for a description of the LED activity.

Table 15 System status LEDs (Nonport side)

LED label	LED color	Indication
System	Off	System initializing (or power is off).
	Green	System status is good.
	Yellow	System or FRU fault(s) detected.
Ports	Off	System initializing (or power is off).
	Green	Port status is good.
	Yellow	Port fault(s) detected.

Fan status LEDs

The fan status LEDs on each fan assembly, as shown in Figure 12, indicate fan assembly status. See Table 16 for a description of the fan status LEDs.

Table 16 Fan status LEDs

LED label		Indication
FAN OK	FAN FAIL	
On (green)	Off	Normal operation
Off	On (yellow)	Fan assembly failure

Management overview

Use the management functions built into the MP Router to monitor the fabric topology, port status, physical status.

You can manage the router using any of the options listed in Table 17.

Table 17 Management options for the MP Router

Management tool	**Out-of-band support**	**In-band support**
Command Line Interface (CLI) Runs up to two admin sessions and four user sessions simultaneously. See the *HP StorageWorks XPath OS 7.4.x administrator guide*.	Ethernet or serial connection	IP over Fibre Channel *
Fabric Manager (option) See the *HP StorageWorks Fabric Manager 5.x administrator guide*.	Ethernet	IP over Fibre Channel *
Advanced Web Tools See the *HP StorageWorks XPath OS 7.4.x Advanced Web Tools user guide*	Ethernet or serial connection	IP over Fibre Channel *
Standard SNMP applications See the *HP StorageWorks XPath OS 7.4.x MIB reference* guide.	Ethernet or serial connection	IP over Fibre Channel *

Table 17 Management options for the MP Router (continued)

Management tool	Out-of-band support	In-band support
Management server See the *HP StorageWorks XPath OS 7.4.x administrator guide* and the *HP StorageWorks XPath OS 7.4.x command reference guide.*	Ethernet or serial connection	Native in-band interface (over HBA only)

* Requirements for running IP over Fibre Channel:

- Must be run on both host bus adapter (HBA) and router.
- Must be supported by both HBA and HBA driver.

MP Router diagnostics

This section describes the CLI commands used to obtain device status, perform diagnostics, and access event and port log information for troubleshooting purposes.

See the following sections for details:

- Viewing device status, page 59
- Viewing the event log, page 63
- Viewing the port log, page 64
- Using the diagnostic commands, page 65

Viewing device status

The following sections describe how to the view MP Router status and the status of its individual components.

MP Router status

Use the `switchstatusshow` command to display the overall status of the MP Router, including its power supplies, fans, and temperature. If the status of any one of these components is either

marginal or down, the overall status of the MP Router is also displayed as marginal or down. If all components have a healthy status, the MP Router appears a healthy status.

The rules used to classify the health of each component are in the Configured foruration files, as shown in Table 18. To change the rules, use the `Configured forupload` and `Configured fordownload` commands to access the Configured foruration files and edit them manually.

Table 18 Component status rules

Component	# Failures	Status
Fan	1	Marginal
	>1	Down
Power	1	Marginal
	2	Down
Temperature sensor	2	Marginal
	>2	Down

Use these steps to view the overall status of the MP Router.

1. Log in to the MP Router as admin.
2. Enter the `switchstatusshow` command.

Example

```
APswitch:admin> switchstatusshow
Switch overall status: Marginal
Reason:
 power supply is in MARGINAL state

Power overall status: Marginal
Fan overall status: Healthy
Temp overall status: Healthy
APswitch:admin>
```

Port status

Use these steps to view the status of a port.

1. Log in to the MP Router as admin.
2. Type the `portshow` command, followed by the number that corresponds to the port you are troubleshooting.

Example

```
APswitch:admin> portshow 2
        port   2  info
                Configured foruration   Current
Name :          port 2
State:          STARTED         UP
Type :          FC              FC
Link Status:    ENABLED         DOWN
Topology:       P-P             P-P
Speed:          AN              AN
LinkCost:       AUTO
WWN:            20:02:00:05:1e:12:f2:00

Licensed        : YES

Diag result     : PASSED

inFrames:       0
outFrames:      0
inOctets:       0
outOctets:      0
discards:       0

APswitch:admin>
```

Fan status

Use these steps to display the status of the fans:

1. Log in to the router as admin.
2. Enter the `fanshow` command.

Example

```
APswitch:admin> fanshow
Fan 1   Status: OK   Set_Speed: NORMAL   Actual_speed: 7010 RPM
Fan 2   Status: OK   Set_Speed: NORMAL   Actual_speed: 7180 RPM
Fan 3   Status: OK   Set_Speed: NORMAL   Actual_speed: 7068 RPM
Fan 4   Status: OK   Set_Speed: NORMAL   Actual_speed: 7116 RPM
Fan 5   Status: OK   Set_Speed: NORMAL   Actual_speed: 7155 RPM
Fan 6   Status: OK   Set_Speed: NORMAL   Actual_speed: 7001 RPM
APswitch:admin>
```

Possible status values include:

- OK—Fan is present and functioning correctly.
- NOT PRESENT—Fan is not present.
- FAIL—Fan is present but faulty.

Power supply status

Use these steps to display the status of a power supply.

1. Log in to the MP Router as admin.
2. Enter the `psshow` command.

Example

```
APswitch:admin> psshow
POWER SUPPLY 1 Serial no:0000101 Part no: 60-0000754-01 Rev: A Status: OK
POWER SUPPLY 2 Serial no:0000096 Part no: 60-0000754-01 Rev: A Status: OK
APswitch:admin>
```

Possible status values include:

- OK—Power supply is present and functioning correctly.
- NOT PRESENT—Power supply is not present.
- FAIL—Power supply is present but faulty.

Temperature status

Use the `tempshow` command to display information for each temperature sensor in the MP Router (the number can vary on different platforms).

1. Log in to the MP Router as admin.
2. Enter the `tempshow` command.

Example

```
APswitch:admin> tempshow

Index       Status       Centigrade       Fahrenheit
-----------------------------------------------------
 1           OK             21               70
 2           OK             22               72
 3           OK             29               84
 4           OK             24               75
 5           OK             25               77
APswitch:admin>
```

The possible temperature status values include:

- OK—Temperature is within acceptable range.
- FAIL—Temperature is outside of acceptable range (10ºC to 40ºC, operating). Damage might occur.

Viewing the event log

The system event log saves all messages generated by the system for the current run cycle. The system event log messages provide information regarding the status of the MP Router and its ports.

Use these steps to view the MP Router event log.

1. Log in to the MP Router as admin.
2. Enter the `errshow` command to list all the event messages, without page breaks.

Example:

```
APswitch:admin> errshow -a
```

There are six severity levels for event messages, ranging from Panic to Debug. The definitions shown in Table 19 can only be used as *general* troubleshooting guidelines; you should review each event description thoroughly before taking action.

Table 19 Event message levels

Event level	Description
0 = Panic	Panic-level messages indicate that a specific software subsystem has detected a fatal or unrecoverable error condition: for example, memory allocation failures, system call failures. Such errors indicate either partial or complete failure of a subsystem.
1 = Critical	Critical-level messages indicate that the software has detected serious problems that will eventually cause a partial or complete failure of a subsystem if not corrected immediately. For example, a power supply failure or rise in temperature must receive immediate attention. Some critical errors might overlap in severity with panic-level messages.
2 = Error	Error-level messages represent an error condition that does not impact overall system functionality significantly. For example, error-level messages might indicate timeouts on certain operations, failures of certain operations after retries, invalid parameters, or failure to perform a requested operation.
3 = Warning	Warning-level messages highlight a current operating condition that should be checked to avoid a future failure. For example, a power supply failure in a redundant system relays a warning that the system is no longer operating in redundant mode until the failed power supply is replaced or fixed.
4 = Information	Information-level messages report the current status of the system components, other than error status: like detecting online and offline fabric port status.
5 = Debug	Used for debugging purposes.

Viewing the port log

XPath OS maintains an internal log of all port activity. The port log stores entries for each port as a circular buffer. Each port has space to store 2,048 log entries. Once the log is full, the newest log entries overwrite the oldest log entries. Port logs are not persistent and are lost over power-cycles and reboots. If the port log is disabled, an error message is displayed.

Use the commands described in Table 20 to view and manage port logs.

Table 20 Commands for port log management

Command	Description
`portlogclear`	Clear port logs for all or particular ports.
`portlogdisable`	Disable port logs for all or particular ports.
`portlogdump`	Display port logs for all or particular ports, without page breaks.
`portlogenable`	Enable port logs for all or particular ports.
`portlogshow`	Display port logs for all or particular ports, with page breaks.

See the *HP StorageWorks XPath OS 7.4.x command reference guide* for detailed information on these commands.

Use these steps to view the port log.

1. Log in to the MP Router as admin.
2. Enter the `portlogshow` command.

Example

```
APswitch:admin> portlogshow 8
Total records present       = 12
Number of records displayed = 12

Time         Module   Event    Port  Len  Log info
-------------------------------------------------------------------------------
18:36:52.036 fabctl   PrtSCN    08   0    st=1, Topo=2, Spd=0
18:36:52.361 WKA      Rx        08   140  22fffffe,00000000,01a6ffff,04000000
18:36:52.362 fabctl   PrtSCN    08   0    st=2, Topo=2, Spd=2
18:36:52.365 fabctl   Debug     08   0    Loading routes
18:36:52.379 fabctl   Tx        08   140  23640800,00fffffe,01a60001,02000000
18:36:52.379 WKA      Rx        08   140  22fffffc,00640800,02effff,03000000
18:36:52.382 nsd      Tx        08   140  23640800,00fffffc,02effff,02000000
18:36:52.382 WKA      Rx        08   32   22fffffd,00640800,02cdffff,62000000
18:36:52.383 fabctl   Tx        08   28   23640800,00fffffd,02cd0001,02000000
18:36:52.383 WKA      Ct_in     08   52   02fffffc,00640800,02d1ffff,01000000
18:36:52.384 nsd      Tx        08   40   03640800,00fffffc,02d1ffff,01000000
18:36:52.384 WKA      Ct_in     08   84   02fffffc,00640800,02d0ffff,01000000
```

Using the diagnostic commands

Use the diagnostic commands available within the CLI to troubleshoot any problems. Use the `diaghelp` command to display all available diagnostic commands, as shown in Table 21.

Table 21 List of diagnostic commands

Command	Description
`burninerrshow`	Displays the burn-in errors of the router.
`burninstatus`	Displays the diagnostics burn-in status.
`celloporttest`	Tests the functionality of router fabric ports.
`crossporttest`	Tests the wire-side transmitting and receiving paths between two ports.
`diagdisablepost`	Disables diagnostic POST2.
`diagenablepost`	Enables diagnostic POST2.
`diaghelp`	Displays a list of diagnostic commands.
`diagportmailbox`	Tests the functionality of internal service modules of a port ASIC.
`diagportmem`	Tests the specific memory of a particular port.
`diagportmemarm`	Tests the memory subsystem of a particular port by the internal CPU of the port.
`diagpost`	Sets or displays the diagnostic POST Configured foruration.
`diagsetburnin`	Initializes the MP Router for a burn-in run.
`diagsetcycle`	Sets diagnostic script parameters.
`diagstopburnin`	Terminates the burn-in run on the MP Router.
`portdiagclear`	Clears a diagnostic error on a port.
`portdiagdisable`	Disables a port for diagnostics.
`portdiagenable`	Enables a port for diagnostics.
`portloopbacktest`	Tests the wire-side transmitting and receiving paths of a port.
`spinsilk`	Tests both the wire-side and crossbar-side operations of a port.

See the *HP StorageWorks XPath OS 7.4.x command reference guide* for a complete description of each command.

5 Replacing FRUs

This chapter describes how to remove and replace the field replaceable units (FRUs) in the MP Router. You can remove and replace each FRU in the MP Router without special tools. The MP Router can continue operating during many of the FRU replacements if you adhere to the conditions specified in the procedures.

See the following sections for specific FRU removal and replacement procedures:

Replacing a power supply

Use this procedure to remove and replace a power supply in the MP Router. If you have two power supplies, they are hot-swappable if one power supply remains operating during the procedure.

Each power supply is identical and fits into either power supply slot. The XPath OS identifies a power supply according to the slot it occupies (see Figure 13).

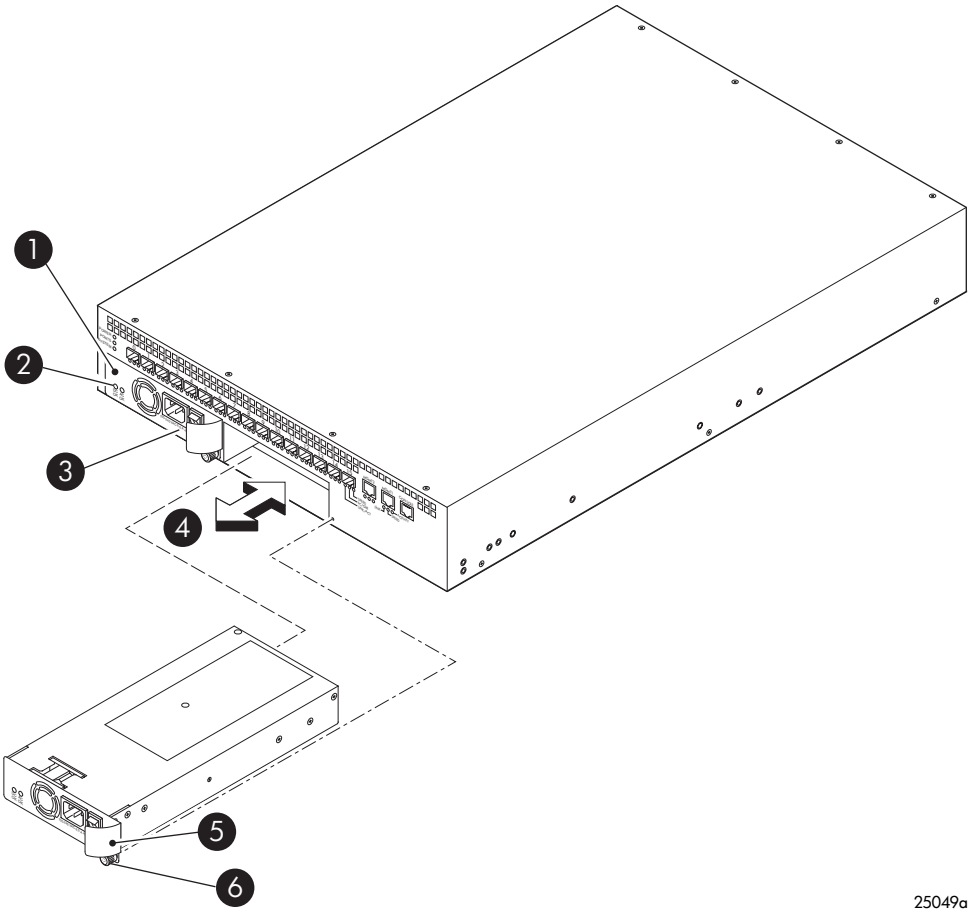


Figure 13 Power Supply removal and replacement

Table 22 Power supply replacement components

Item	Description		Item	Description
1	Power supplies (2)		4	Power supply slot #2
2	Power supply LEDs		5	Yellow handle
3	AC outlet and switch		6	Captive screw

Time required

Less than 15 minutes.

Items required

- New power supply
- Phillips screwdriver

NOTE: Disassembling any part of the power supply voids the part warranty and regulatory certifications. There are no user-serviceable parts inside the power supply. Because the cooling system relies on pressurized air, do not leave either of the power supply slots empty longer than 15 minutes while the MP Router is operating. If a power supply fails, leave it in the MP Router until it can be replaced. Maintain both power supplies in operational condition to provide redundancy.

Each power supply uses two LEDs to indicate its status. See Table 13 on page 55 for a list of power supply LEDs.

CAUTION: Do not remove one power supply until the other one is verified as powered on for at least 4 seconds and both of its LEDs are green (on). If you intend to replace a power supply while the MP Router is operating, the replacement power supply must be installed and operating within 15 minutes to maintain correct air pressure within the chassis.

Procedure

Follow these steps to remove and replace a power supply:

1. If the MP Router is to continue operating during the replacement, verify that the remaining power supply has been powered on for at least four seconds and both of its LEDs are green (on).
2. Power off the power supply being replaced by pressing the AC power switch to 0; then, unplug the power cord from the AC receptacle.

   See Figure 13 on page 68 for the location of the AC power switch and receptacle.

3. Remove the power supply from the chassis:
   a. Unscrew the captive screw (see Figure 13 on page 68). If the captive screw is too tight, use a Phillips screwdriver to loosen it.
   b. Grasp the yellow handle on the power supply (see <Link>Figure 13 on page -68).
   c. Pull the power supply straight out of the chassis.
4. Install the new power supply:
   a. Verify that the AC power switch is in the 0 position.
   b. Orient the power supply as shown in Figure 13 on page 68, with the yellow handle on the right.
   c. Gently push the power supply into the chassis until it is firmly seated.

CAUTION: Do not force the installation. If the power supply does not slide in easily, ensure that it is correctly oriented before continuing with the installation.

   d. Tighten the captive screw.
5. Connect the power cord to the power supply and press the AC power switch to 1.
6. Verify that both LEDs on the new power supply display a continuous green light while the MP Router is operating. If either of the LEDs is not green, ensure that the power supply is firmly seated.

Replacing a fan assembly

Use this procedure to remove and replace a fan assembly in the MP Router. The MP Router can continue operating during the replacement procedure if the other fan assembly continues to operate

and the replacement is completed within 15 minutes to ensure correct air pressure inside the chassis.

Each MP Router has two fan assembly slots, and each fan assembly contains three fans. The fan assemblies fit into either of the fan assembly slots. After they are installed, the fans are identified by the XPath OS from left to right as fan #1, #2, #3, #4, #5, and #6 (see Figure 14).

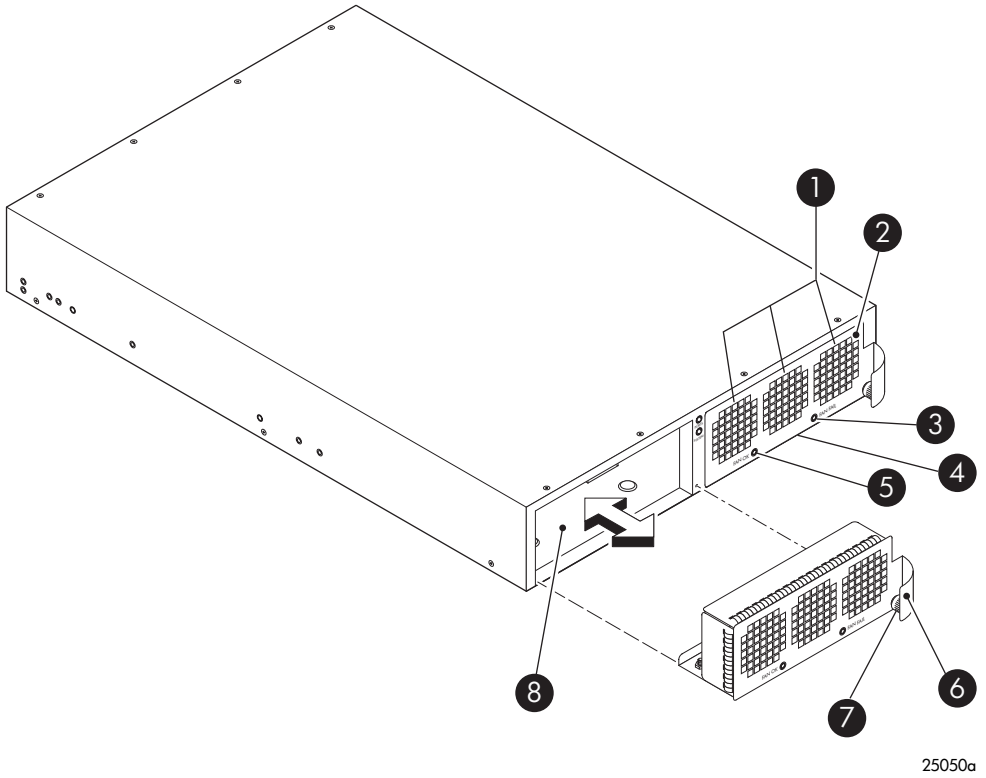


Figure 14 Fan assembly removal and replacement

Table 23 Fan assembly replacement components

Item	Description		Item	Description
1	Location of fans (3 for each assembly, 6 total)		**5**	FAN OK LED
2	Fan assembly slot #3		**6**	Yellow handle
3	Fan Fail LED		**7**	Captive screw
4	Fan assembly slot #2		**8**	Fan assembly slot #1

Time required

Less than 15 minutes.

Items required

- New fan assembly
- Phillips screwdriver (optional)

CAUTION: Disassembling any part of the fan assembly voids the part warranty and regulatory certifications. There are no user-serviceable parts inside the fan assembly.

Since the cooling system relies on pressurized air, do not leave either of the fan assembly slots empty longer than 15 minutes while the MP Router is operating. If a fan assembly fails, leave it in the chassis until it can be replaced. Maintain both fan assemblies in operational condition to provide proper unit cooling.

Each fan assembly uses two LEDs to indicate its status. See Table 16 on page 57 for a list of fan assembly LEDs.

CAUTION: If you replace a fan assembly while the MP Router is operating, you must install it and verify that it is operational within 15 minutes to maintain correct air pressure within the chassis.

Procedure

Follow these steps to remove and replace a fan assembly:

1. Remove the fan assembly from the chassis:
   a. Unscrew the captive screw (see Figure 14 on page 71). If it is too tight, use a Phillips screwdriver to loosen it.
   b. Grasp the yellow handle on the fan assembly (see Figure 14).
   c. Pull the fan assembly straight out of the chassis.
2. Install the new fan assembly:
   a. Orient the new fan assembly with the yellow handle on the right (see Figure 14).
   b. Gently push the fan assembly into the chassis until it is firmly seated.

CAUTION: Do not force the installation. If the fan assembly does not slide in easily, ensure that it is correctly oriented before continuing with the installation.

   c. Tighten the captive screw.
   If the MP Router is powered on, the fan assembly begins operating as soon as it is correctly seated.

3. Verify that the fan assembly is functioning correctly.
   The FAN OK LED should be green and the FAN FAIL LED should be off (see Figure 14).

Enter `fanShow` at the command line prompt to view fan status. For more information about this command, see the *HP StorageWorks XPath OS 7.4.x command reference guide*.

Replacing an SFP

The MP Router was designed to work with SFP optical modules. SFPs provide optical connections to external devices for both SWL and LWL connections. SFPs are replaced using a new pluggable unit, rather than replacing the MP Router.

For a list of supported SFPs, enter the `sfpSupport` command.

Time required

Less than 5 minutes.

Items required

- New SFP
- New cable (if necessary)

Procedure

To remove and replace an SFP from an MP Router:

1. Verify that there is no activity by viewing the MP Router LEDs.
   For details about LED activity on the MP Router, see "Interpreting LED activity" on page 51.
2. Remove the cable from the SFP module.

3. Remove the SFP module according to the manufacturer's instructions or as shown in Figure 15.

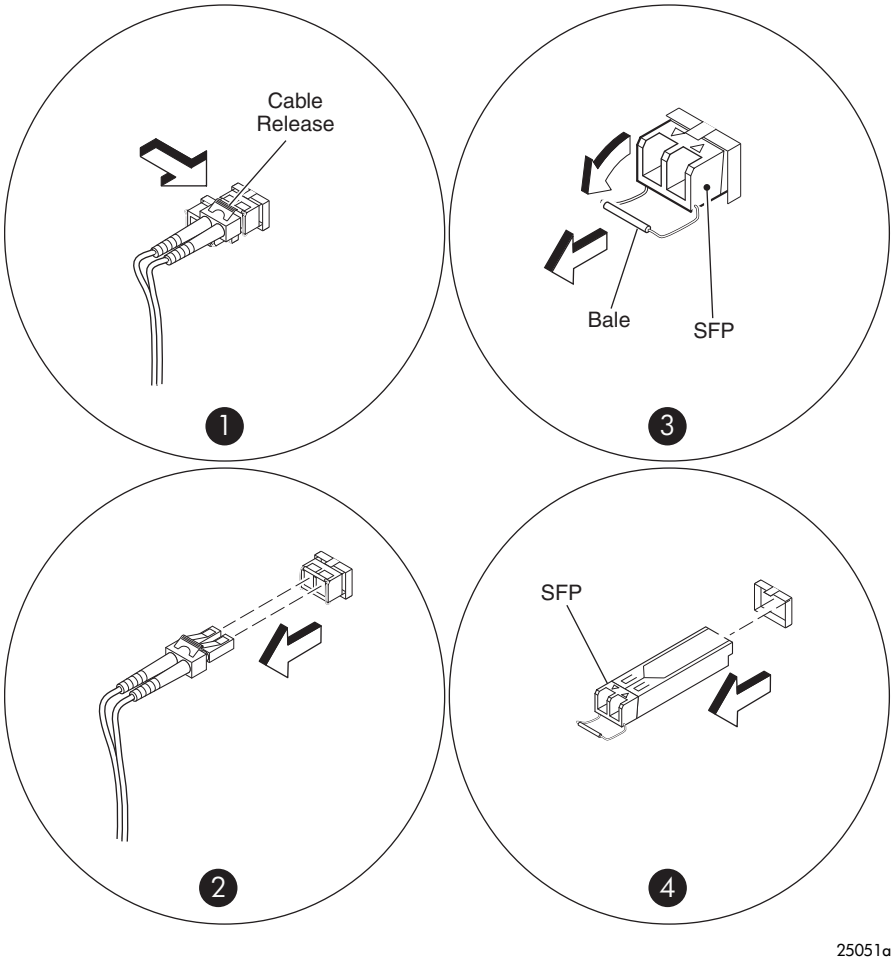


Figure 15 Replacing an SFP

4. Position the replacement SFP so that it is oriented correctly, and insert it into a port until it is firmly seated and the latching mechanism clicks.

   SFPs are keyed to ensure correct orientation. If one does not install easily, check the orientation.

   For instructions specific to the type of SFP, see the manufacturer's documentation.

5. Connect the cable to the SFP:

CAUTION: A 50-micron cable should not be bent to a radius less than is 2 inches under full tensile load and less than 1.2 inches with no tensile load. Tie wraps are not recommended for optical cables because they are easily overtightened.

   a. Orient a cable connector so that the key (the ridge on one side of connector) aligns with the slot in the SFP.
   b. Insert the cable into the SFP until the latching mechanism clicks.

   SFPs are keyed to ensure correct orientation. If one does not install easily, check the orientation.

   For instructions specific to cable type, see the cable manufacturer's documentation.

6. Verify that the SFP is functioning correctly.

   Enter `sfpShow` at the command line prompt to view SFP status. Enter `sfpSupport` for a list of supported SFPs. For more information about these commands, see the *HP StorageWorks XPath OS 7.4.x command reference guide*.

A Technical specifications

This appendix lists MP Router product specifications, including:

System architecture

Table 24 describes the MP Router system architecture.

Table 24 System architecture

Feature	Description
Dual-mode ports	16 ports, Fibre Channel (E, F) and Gigabit Ethernet
Router interoperability	See the product Release Notes for the most up-to-date Fibre Channel switch compatibility information. This information is also provided in the *HP StorageWorks SAN Design Reference Guide* available on the web at: http://h18006.www1.hp.com/products/storageworks/san/documentation.html
Performance	1.063 Gb/s line speed, full duplex; 2.125 Gb/s line speed, full duplex; auto-sensing of 1 Gb/s and 2 Gb/s port speeds; optionally programmable to fixed port speed; speed matching between 1 Gb/s and 2 Gb/s ports
Aggregate bandwidth	42 Gb/s end-to-end
Fabric latency	Storage application dependent
Maximum size frame	2112-byte payload FC; 1518-byte payload Gigabit Ethernet
Classes of service	Class 3
Port types	FL_Port (restricted), F_Port, and E_Port; self-discovery based on switch type (U_Port); Gigabit Ethernet
Media types	Small form-factor pluggable (SFP) laser; short-wave up to 500 m (1,640 feet); long-wave up to 10 km (6.2 miles), extended long-wave up to 25 km (15.5 miles)
Fabric services	Simple Name Server; Registered State Change Notification (RSCN); optional fabric services, including Advanced Zoning, Exchange-Based Trunking, and Advance Web Tools, plus Fibre Channel Routing and FCIP

Table 24 System architecture (continued)

Feature	Description
Management software (supported)	Telnet; SNMP; Advanced Web Tools; Fabric Manager (optional)
Management access	10/100 Ethernet port (RJ-45); serial port (RS-232); in-band via Management Server
Diagnostics	POST and embedded online/offline diagnostics

Chassis dimensions

The MP Router chassis has the following characteristics:

- Height—3.46 inches (8.79 cm)
- Width—16.8 inches (42.67 cm)
- Depth—25.0 inches (63.5 cm)
- Weight (two power supplies installed)—40 lbs (18.14 kg)

Power specifications

The power supply is auto-ranging and supports from 90 VAC to 250 VAC and from 47 Hz to 63 Hz. The operating range and current rating for typical operating conditions include:

- Input voltage—100 to 120 VAC or 200 to 240 VAC
- AC line frequency—47 to 63 Hz
- Current rating—6A or 3A

Environmental specifications

Table 25 lists operating and nonoperating environmental values.

Table 25 Environmental specifications

Environmental value	Operating	Nonoperating
Temperature	10°C to 40°C	-25°C to 70°C
Humidity	20 to 85% noncondensing	20 to 85% noncondensing
Altitude	3 KM	3 KM
Shock	105 G, 2.5 ms, half-sine	40 G, 13 ms, trapezoidal
Vibration	0.5 G (5-500-5 Hz)	2.0 G (5-500-5 Hz)

B Regulatory compliance and safety

Federal Communications Commission notice for Class A equipment

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense. The end user of this product should be aware that any changes or modifications made to this equipment without the approval of Hewlett-Packard could result in the product not meeting the Class A limits, in which case the FCC could void the user's authority to operate the equipment.

Declaration of conformity for products marked with the FCC logo, United States only

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

For questions regarding your product, visit http://www.hp.com.

For questions regarding this FCC declaration, contact us by mail or telephone:

- Hewlett-Packard Company
  P.O. Box 692000, Mailstop 510101
  Houston, Texas 77269-2000
- 1-281-514-3333

To identify this product, see the part, Regulatory Model Number, or product number found on the product.

Modifications

The FCC requires the user to be notified that any changes or modifications made to this device that are not expressly approved by Hewlett-Packard Company may void the user's authority to operate the equipment.

Cables

Connections to this device must be made with shielded cables with metallic RFI/EMI connector hoods in order to maintain compliance with FCC Rules and Regulations.

Regulatory compliance identification numbers

For the purpose of regulatory compliance certifications and identification, your product has been assigned a unique Regulatory Model Number. The RMN can be found on the product nameplate label, along with all required approval markings and information. When requesting compliance information for this product, always see this RMN. The Regulatory Model Number should not be confused with the marketing name or model number of the product.

HP StorageWorks Multi-protocol Router Regulatory Model Number: HSTNM-NB01

Laser device

All HP systems equipped with a laser device comply with safety standards, including International Electrotechnical Commission (IEC) 825. With specific regard to the laser, the equipment complies with laser product performance standards set by government agencies as a Class 1 laser product. The product does not emit hazardous light.

Laser safety warning

⚠ **WARNING!** To reduce the risk of exposure to hazardous radiation:

- Do not try to open the laser device enclosure. There are no user-serviceable components inside.
- Do not operate controls, make adjustments, or perform procedures to the laser device other than those specified herein.
- Allow only HP-authorized service technicians to repair the laser device.

Certification and classification information

This product contains a laser internal to the fiber optic (FO) transceiver for connection to the Fibre Channel communications port.

In the USA, the FO transceiver is certified as a Class 1 laser product conforming to the requirements contained in the Department of Health and Human Services (DHHS) regulation 21 CFR, Subchapter J. A label on the plastic FO transceiver housing indicates the certification.

Outside the USA, the FO transceiver is certified as a Class 1 laser product conforming to the requirements contained in IEC 825-1:1993 and EN 60825-1:1994, including Amendment 11:1996 and Amendment 2:2001.

Laser product label

The optional label in Figure 16 or equivalent may be located on the surface of the HP supplied laser device.

This optional label indicates that the product is classified as a CLASS 1 LASER PRODUCT. This label may appear on the laser device installed in your product.

Figure 16 Class 1 laser product label

International notices and statements

Canadian notice (avis Canadien)

Class A equipment

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

European Union notice

Products bearing the CE marking comply with the EMC Directive (89/336/EEC) and the Low Voltage Directive (73/23/EEC) issued by the Commission of the European Community and if this product has telecommunication functionality, the R&TTE Directive (1999/5/EC).

Compliance with these directives implies conformity to the following European Norms (in parentheses are the equivalent international standards and regulations):

- EN55022 (CISPR 22) - Electromagnetic Interference
- EN55024 (IEC61000-4-2, IEC61000-4-3, IEC61000-4- 4, IEC61000-4-5, IEC61000-4-6, IEC61000-4-8, IEC61000-4-11) - Electromagnetic Immunity
- Power Quality:
  - EN61000-3-2 (IEC61000-3-2) - Power Line Harmonics
  - EN61000-3-3 (IEC61000-3-3) - Power Line Flicker
- EN60950 (IEC60950) - Product Safety
- Also approved under UL 60950/CSA C22.2 No. 60950-00, Safety of Information Technology Equipment.

BSMI notice

警告使用者:
這是甲類的資訊產品，在居住的
環境中使用時，可能會造成射頻
干擾，在這種情況下，使用者會
被要求採取某些適當的對策。

Japanese notice

ご使用になっている装置にVCCIマークが付いていましたら、次の説明文をお読み下さい。

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラスB情報技術装置です。この装置は、家庭環境で使用することを目的としていますが、この装置がラジオやテレビジョン受信機に近接して使用されると、受信障害を引き起こすことがあります。
取扱説明書に従って正しい取り扱いをして下さい。

VCCIマークが付いていない場合には、次の点にご注意下さい。

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラスA情報技術装置です　この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

Korean notices

KOREAN NOTICE

A급 기기 (업무용 정보통신기기)

이 기기는 업무용으로 전자파적합등록을 한 기기이오니 판매자 또는 사용자는 이 점을 주의하시기 바라며, 만약 잘못판매 또는 구입하였을 때에는 가정용으로 교환하시기 바랍니다.

브로케이드 커뮤니케이션 시스템

B급 기기 (가정용 정보통신기기)

이 기기는 가정용으로 전자파적합등록을 한 기기로서 주거지역에서는 물론 모든지역에서 사용할 수 있습니다.

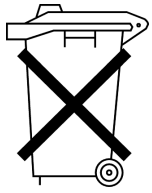
Safety

Battery replacement notice

Your switch is equipped with a lithium manganese dioxide, a vanadium pentoxide, or an alkaline internal battery or battery pack. There is a danger of explosion and risk of personal injury if the battery is incorrectly replaced or mistreated. Replacement is to be done by an HP-authorized service provider using the HP spare part designated for this product. For more information about battery replacement or proper disposal, contact an HP-authorized reseller or HP-authorized service provider.

⚠ **WARNING!** Your switch contains an internal lithium manganese dioxide, a vanadium pentoxide, or an alkaline battery pack. There is risk of fire and burns if the battery pack is not properly handled. To reduce the risk of personal injury:

- Do not attempt to recharge the battery.
- Do not expose to temperatures higher than 60°C.
- Do not disassemble, crush, puncture, short external contacts, or dispose of in fire or water.
- Replace only with the HP spare part designated for this product.



Batteries, battery packs, and accumulators should not be disposed of together with the general household waste. To forward them to recycling or proper disposal, please use the public collection system or return them to HP, an authorized HP Partner, or their agents.

For more information about battery replacement or proper disposal, contact an HP-authorized reseller or service provider.

Taiwan battery recycling notice

The Taiwan EPA requires dry battery manufacturing or importing firms in accordance with Article 15 of the Waste Disposal Act to indicate the recovery marks on the batteries used in sales, giveaway or promotion. Contact a qualified Taiwanese recycler for proper battery disposal.

Power cords

The power cord set must meet the requirements for use in the country where the product was purchased. If the product is to be used in another country, purchase a power cord that is approved for use in that country.

The power cord must be rated for the product and for the voltage and current marked on the product electrical ratings label. The voltage and current rating of the cord should be greater than the voltage

and current rating marked on the product. In addition, the diameter of the wire must be a minimum of 1.00 mm^2 or 18 AWG, and the length of the cord must be between 1.8 m (6 ft) and 3.6 m (12 ft). If you have questions about the type of power cord to use, contact an HP-authorized service provider.

NOTE: Route power cords so that they will not be walked on and cannot be pinched by items placed upon or against them. Pay particular attention to the plug, electrical outlet, and the point where the cords exit from the product.

Japanese power cord notice

製品には、同梱された電源コードをお使い下さい。
同梱された電源コードは、他の製品では使用出来ません。

Waste Electrical and Electronic Equipment directive

Czechoslovakian notice

Likvidace zařízení soukromými domácími uživateli v Evropské unii

Tento symbol na produktu nebo balení označuje výrobek, který nesmí být vyhozen spolu s ostatním domácím odpadem. Povinností uživatele je předat takto označený odpad na předem určené sběrné místo pro recyklaci elektrických a elektronických zařízení. Okamžité třídění a recyklace odpadu pomůže uchovat přírodní prostředí a zajistí takový způsob recyklace, který ochrání zdraví a životní prostředí člověka. Další informace o možnostech odevzdání odpadu k recyklaci získáte na příslušném obecním nebo městském úřadě, od firmy zabývající se sběrem a svozem odpadu nebo v obchodě, kde jste produkt zakoupili.

Danish notice

Bortskaffelse af affald fra husstande i den Europæiske Union

Hvis produktet eller dets emballage er forsynet med dette symbol, angiver det, at produktet ikke må bortskaffes med andet almindeligt husholdningsaffald. I stedet er det dit ansvar at bortskaffe kasseret udstyr ved at aflevere det på den kommunale genbrugsstation, der forestår genvinding af kasseret elektrisk og elektronisk udstyr. Den centrale modtagelse og genvinding af kasseret udstyr i forbindelse med bortskaffelsen bidrager til bevarelse af naturlige ressourcer og sikrer, at udstyret genvindes på en måde, der beskytter både mennesker og miljø. Yderligere oplysninger om, hvor du kan aflevere kasseret udstyr til genvinding, kan du få hos kommunen, den lokale genbrugsstation eller i den butik, hvor du købte produktet.

Dutch notice

Verwijdering van afgedankte apparatuur door privé-gebruikers in de Europese Unie

Dit symbool op het product of de verpakking geeft aan dat dit product niet mag worden gedeponeerd bij het normale huishoudelijke afval. U bent zelf verantwoordelijk voor het inleveren van uw afgedankte apparatuur bij een inzamelingspunt voor het recyclen van oude elektrische en elektronische apparatuur. Door uw oude apparatuur apart aan te bieden en te recyclen, kunnen natuurlijke bronnen worden behouden en kan het materiaal worden hergebruikt op een manier waarmee de volksgezondheid en het milieu worden beschermd. Neem contact op met uw gemeente, het afvalinzamelingsbedrijf of de winkel waar u het product hebt gekocht voor meer informatie over inzamelingspunten waar u oude apparatuur kunt aanbieden voor recycling.

English notice

Disposal of waste equipment by users in private household in the European Union

This symbol on the product or on its packaging indicates that this product must not be disposed of with your other household waste. Instead, it is your responsibility to dispose of your waste equipment by handing it over to a designated collection point for recycling of waste electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help to conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste equipment for recycling, please contact your local city office, your household waste disposal service, or the shop where you purchased the product.

Estonian notice

Seadmete jäätmete kõrvaldamine eramajapidamistes Euroopa Liidus

See tootel või selle pakendil olev sümbol näitab, et kõnealust toodet ei tohi koos teiste majapidamisjäätmetega kõrvaldada. Teie kohus on oma seadmete jäätmed kõrvaldada, viies need elektri- ja elektroonikaseadmete jäätmete ringlussevõtmiseks selleks ettenähtud kogumispunkti. Seadmete jäätmete eraldi kogumine ja ringlussevõtmine kõrvaldamise ajal aitab kaitsta loodusvarasid ning tagada, et ringlussevõtmine toimub viisil, mis kaitseb inimeste tervist ning keskkonda. Lisateabe saamiseks selle kohta, kuhu oma seadmete jäätmed ringlussevõtmiseks viia, võtke palun ühendust oma kohaliku linnakantselei, majapidamisjäätmete kõrvaldamise teenistuse või kauplusega, kust Te toote ostsite.

Finnish notice

Laitteiden hävittäminen kotitalouksissa Euroopan unionin alueella

Jos tuotteessa tai sen pakkauksessa on tämä merkki, tuotetta ei saa hävittää kotitalousjätteiden mukana. Tällöin hävitettävä laite on toimitettava sähkölaitteiden ja elektronisten laitteiden kierrätyspisteeseen. Hävitettävien laitteiden erillinen käsittely ja kierrätys auttavat säästämään luonnonvaroja ja varmistamaan, että laite kierrätetään tavalla, joka estää terveyshaitat ja suojelee luontoa. Lisätietoja paikoista, joihin hävitettävät laitteet voi toimittaa kierrätettäväksi, saa ottamalla yhteyttä jätehuoltoon tai liikkeeseen, josta tuote on ostettu.

French notice

Élimination des appareils mis au rebut par les ménages dans l'Union européenne

Le symbole apposé sur ce produit ou sur son emballage indique que ce produit ne doit pas être jeté avec les déchets ménagers ordinaires. Il est de votre responsabilité de mettre au rebut vos appareils en les déposant dans les centres de collecte publique désignés pour le recyclage des équipements électriques et électroniques. La collecte et le recyclage de vos appareils mis au rebut indépendamment du reste des déchets contribue à la préservation des ressources naturelles et garantit que ces appareils seront recyclés dans le respect de la santé humaine et de l'environnement. Pour obtenir plus d'informations sur les centres de collecte et de recyclage des appareils mis au rebut, veuillez contacter les autorités locales de votre région, l es services de collecte des ordures ménagères ou le magasin dans lequel vous avez acheté ce produit.

German notice

Entsorgung von Altgeräten aus privaten Haushalten in der EU

Das Symbol auf dem Produkt oder seiner Verpackung weist darauf hin, dass das Produkt nicht über den normalen Hausmüll entsorgt werden darf. Benutzer sind verpflichtet, die Altgeräte an einer Rücknahmestelle für Elektro- und Elektronik-Altgeräte abzugeben. Die getrennte Sammlung und ordnungsgemäße Entsorgung Ihrer Altgeräte trägt zur Erhaltung der natürlichen Ressourcen bei und garantiert eine Wiederverwertung, die die Gesundheit des Menschen und die Umwelt schützt. Informationen dazu, wo Sie Rücknahmestellen für Ihre Altgeräte finden, erhalten Sie bei Ihrer Stadtverwaltung, den örtlichen Müllentsorgungsbetrieben oder im Geschäft, in dem Sie das Gerät erworben haben.

Greek notice

Απόρριψη άχρηστου εξοπλισμού από χρήστες σε ιδιωτικά νοικοκυριά στην Ευρωπαϊκή Ένωση

Το σύμβολο αυτό στο προϊόν ή τη συσκευασία του υποδεικνύει ότι το συγκεκριμένο προϊόν δεν πρέπει να διατίθεται μαζί με τα άλλα οικιακά σας απορρίμματα. Αντίθετα, είναι δική σας ευθύνη να απορρίψετε τον άχρηστο εξοπλισμό σας παραδίδοντάς τον σε καθορισμένο σημείο συλλογής για την ανακύκλωση άχρηστου ηλεκτρικού και ηλεκτρονικού εξοπλισμού. Η ξεχωριστή συλλογή και ανακύκλωση του άχρηστου εξοπλισμού σας κατά την απόρριψη θα συμβάλει στη διατήρηση των φυσικών πόρων και θα διασφαλίσει ότι η ανακύκλωση γίνεται με τρόπο που προστατεύει την ανθρώπινη υγεία και το περιβάλλον. Για περισσότερες πληροφορίες σχετικά με το πού μπορείτε να παραδώσετε τον άχρηστο εξοπλισμό σας για ανακύκλωση, επικοινωνήστε με το αρμόδιο τοπικό γραφείο, την τοπική υπηρεσία διάθεσης οικιακών απορριμμάτων ή το κατάστημα όπου αγοράσατε το προϊόν.

Hungarian notice

Készülékek magánháztartásban történő selejtezése az Európai Unió területén

A készüléken, illetve a készülék csomagolásán látható azonos szimbólum annak jelzésére szolgál, hogy a készülék a selejtezés során az egyéb háztartási hulladéktól eltérő módon kezelendő. A vásárló a hulladékká vált készüléket köteles a kijelölt gyűjtőhelyre szállítani az elektromos és elektronikai készülékek újrahasznosítása céljából. A hulladékká vált készülékek selejtezéskori begyűjtése és újrahasznosítása hozzájárul a természeti erőforrások megőrzéséhez, valamint biztosítja a selejtezett termékek környezetre és emberi egészségre nézve biztonságos feldolgozását. A begyűjtés pontos helyéről bővebb tájékoztatást a lakhelye szerint illetékes önkormányzattól, az illetékes szemételtakarító vállalattól, illetve a terméket elárusító helyen kaphat.

Italian notice

Smaltimento delle apparecchiature da parte di privati nel territorio dell'Unione Europea

Questo simbolo presente sul prodotto o sulla sua confezione indica che il prodotto non può essere smaltito insieme ai rifiuti domestici. È responsabilità dell'utente smaltire le apparecchiature consegnandole presso un punto di raccolta designato al riciclo e allo smaltimento di apparecchiature elettriche ed elettroniche. La raccolta differenziata e il corretto riciclo delle apparecchiature da smaltire permette di proteggere la salute degli individui e l'ecosistema. Per ulteriori informazioni relative ai punti di raccolta delle apparecchiature, contattare l'ente locale per lo smaltimento dei rifiuti, oppure il negozio presso il quale è stato acquistato il prodotto.

Latvian notice

Nolietotu iekārtu iznīcināšanas noteikumi lietotājiem Eiropas Savienības privātajās mājsaimniecībās

Šāds simbols uz izstrādājuma vai uz tā iesaiņojuma norāda, ka šo izstrādājumu nedrīkst izmest kopā ar citiem sadzīves atkritumiem. Jūs atbildat par to, lai nolietotās iekārtas tiktu nodotas speciāli iekārtotos punktos, kas paredzēti izmantoto elektrisko un elektronisko iekārtu savākšanai otrreizējai pārstrādei. Atsevišķa nolietoto iekārtu savākšana un otrreizējā pārstrāde palīdzēs saglabāt dabas resursus un garantēs, ka šīs iekārtas tiks otrreizēji pārstrādātas tādā veidā, lai pasargātu vidi un cilvēku veselību. Lai uzzinātu, kur nolietotās iekārtas var izmest otrreizējai pārstrādei, jāvēršas savas dzīves vietas pašvaldībā, sadzīves atkritumu savākšanas dienestā vai veikalā, kurā izstrādājums tika nopirkts.

Lithuanian notice

Nolietotu iekārtu iznīcināšanas noteikumi lietotājiem Eiropas Savienības privātajās mājsaimniecībās

Šāds simbols uz izstrādājuma vai uz tā iesaiņojuma norāda, ka šo izstrādājumu nedrīkst izmest kopā ar citiem sadzīves atkritumiem. Jūs atbildat par to, lai nolietotās iekārtas tiktu nodotas speciāli iekārtotos punktos, kas paredzēti izmantoto elektrisko un elektronisko iekārtu savākšanai otrreizējai pārstrādei. Atsevišķa nolietoto iekārtu savākšana un otrreizējā pārstrāde palīdzēs saglabāt dabas resursus un garantēs, ka šīs iekārtas tiks otrreizēji pārstrādātas tādā veidā, lai pasargātu vidi un cilvēku veselību. Lai uzzinātu, kur nolietotās iekārtas var izmest otrreizējai pārstrādei, jāvēršas savas dzīves vietas pašvaldībā, sadzīves atkritumu savākšanas dienestā vai veikalā, kurā izstrādājums tika nopirkts.

Polish notice

Pozbywanie się zużytego sprzętu przez użytkowników w prywatnych gospodarstwach domowych w Unii Europejskiej

Ten symbol na produkcie lub jego opakowaniu oznacza, że produktu nie wolno wyrzucać do zwykłych pojemników na śmieci. Obowiązkiem użytkownika jest przekazanie zużytego sprzętu do wyznaczonego punktu zbiórki w celu recyklingu odpadów powstałych ze sprzętu elektrycznego i elektronicznego. Osobna zbiórka oraz recykling zużytego sprzętu pomogą w ochronie zasobów naturalnych i zapewnią ponowne wprowadzenie go do obiegu w sposób chroniący zdrowie człowieka i środowisko. Aby uzyskać więcej informacji o tym, gdzie można przekazać zużyty sprzęt do recyklingu, należy się skontaktować z urzędem miasta, zakładem gospodarki odpadami lub sklepem, w którym zakupiono produkt.

Portuguese notice

Descarte de Lixo Elétrico na Comunidade Européia

Este símbolo encontrado no produto ou na embalagem indica que o produto não deve ser descartado no lixo doméstico comum. É responsabilidade do cliente descartar o material usado (lixo elétrico), encaminhando-o para um ponto de coleta para reciclagem. A coleta e a reciclagem seletivas desse tipo de lixo ajudarão a conservar as reservas naturais; sendo assim, a reciclagem será feita de uma forma segura, protegendo o ambiente e a saúde das pessoas. Para obter mais informações sobre locais que reciclam esse tipo de material, entre em contato com o escritório da HP em sua cidade, com o serviço de coleta de lixo ou com a loja em que o produto foi adquirido.

Slovakian notice

Likvidácia vyradených zariadení v domácnostiach v Európskej únii

Symbol na výrobku alebo jeho balení označuje, že daný výrobok sa nesmie likvidovať s domovým odpadom. Povinnosťou spotrebiteľa je odovzdať vyradené zariadenie v zbernom mieste, ktoré je určené na recykláciu vyradených elektrických a elektronických zariadení. Separovaný zber a recyklácia vyradených zariadení prispieva k ochrane prírodných zdrojov a zabezpečuje, že recyklácia sa vykonáva spôsobom chrániacim ľudské zdravie a životné prostredie. Informácie o zberných miestach na recykláciu vyradených zariadení vám poskytne miestne zastupiteľstvo, spoločnosť zabezpečujúca odvoz domového odpadu alebo obchod, v ktorom ste si výrobok zakúpili.

Slovenian notice

Odstranjevanje odslužene opreme uporabnikov v zasebnih gospodinjstvih v Evropski uniji

Ta znak na izdelku ali njegovi embalaži pomeni, da izdelka ne smete odvreči med gospodinjske odpadke. Nasprotno, odslužено opremo morate predati na zbirališče, pooblaščeno za recikliranje odslužene električne in elektronske opreme. Ločeno zbiranje in recikliranje odslužene opreme prispeva k ohranjanju naravnih virov in zagotavlja recikliranje te opreme na zdravju in okolju neškodljiv način. Za podrobnejše informacije o tem, kam lahko odpeljete odslužено opremo na recikliranje, se obrnite na pristojni organ, komunalno službo ali trgovino, kjer ste izdelek kupili.

Spanish notice

Eliminación de residuos de equipos eléctricos y electrónicos por parte de usuarios particulares en la Unión Europea

Este símbolo en el producto o en su envase indica que no debe eliminarse junto con los desperdicios generales de la casa. Es responsabilidad del usuario eliminar los residuos de este tipo depositándolos en un "punto limpio" para el reciclado de residuos eléctricos y electrónicos. La recogida y el reciclado selectivos de los residuos de aparatos eléctricos en el momento de su eliminación contribuirá a conservar los recursos naturales y a garantizar el reciclado de estos residuos de forma que se proteja el medio ambiente y la salud. Para obtener más información sobre los puntos de recogida de residuos eléctricos y electrónicos para reciclado, póngase en contacto con su ayuntamiento, con el servicio de eliminación de residuos domésticos o con el establecimiento en el que adquirió el producto.

Swedish notice

Bortskaffande av avfallsprodukter från användare i privathushåll inom Europeiska Unionen

Om den här symbolen visas på produkten eller förpackningen betyder det att produkten inte får slängas på samma ställe som hushållssopor. I stället är det ditt ansvar att bortskaffa avfallet genom att överlämna det till ett uppsamlingsställe avsett för återvinning av avfall från elektriska och elektroniska produkter. Separat insamling och återvinning av avfallet hjälper till att spara på våra naturresurser och gör att avfallet återvinns på ett sätt som skyddar människors hälsa och miljön. Kontakta ditt lokala kommunkontor, din närmsta återvinningsstation för hushållsavfall eller affären där du köpte produkten för att få mer information om var du kan lämna ditt avfall för återvinning.

C Electrostatic discharge recommendations

To prevent damaging the system, be aware of the precautions you need to follow when setting up the system or handling parts. A discharge of static electricity from a finger or other conductor may damage system boards or other static-sensitive devices. This type of damage may reduce the life expectancy of the device.

To prevent electrostatic damage, observe the following precautions:

- Avoid hand contact by transporting and storing products in static-safe containers.
- Keep electrostatic-sensitive parts in their containers until they arrive at static-free workstations.
- Place parts on a grounded surface before removing them from their containers.
- Avoid touching pins, leads, or circuitry.
- Always make sure you are properly grounded when touching a static-sensitive component or assembly.

Grounding methods

There are several methods for grounding. Use one or more of the following methods when handling or installing electrostatic-sensitive parts:

- Use a wrist strap connected by a ground cord to a grounded workstation or computer chassis. Wrist straps are flexible straps with a minimum of
  1 megohm ± 10 percent resistance in the ground cords. To provide proper ground, wear the strap snug against the skin.
- Use heel straps, toe straps, or boot straps at standing workstations. Wear the straps on both feet when standing on conductive floors or dissipating floor mats.
- Use conductive field service tools.
- Use a portable field service kit with a folding static-dissipating work mat.

If you do not have any of the suggested equipment for proper grounding, have an HP-authorized reseller install the part.

NOTE: For more information on static electricity, or for assistance with product installation, contact your HP-authorized reseller.

Glossary

A

AL_PA Arbitrated loop physical address. A unique 8-bit value assigned during loop initialization to a port in an arbitrated loop.

alias server A fabric software facility that supports multicast group management.

API Application programming interface. A defined protocol that allows applications to interface with a set of services.

AW_TOV Arbitration wait time-out value. The minimum time an arbitrating L_Port waits for a response before beginning loop initialization.

B

bandwidth The total transmission capacity of a cable, link, or system. Usually measured in bps (bits per second). May also refer to the range of transmission frequencies available to a link or system.

broadcast The transmission of data from a single source to all devices in the fabric, regardless of zoning.

buffer-to-buffer flow control Management of the frame transmission rate in either a point-to-point topology or in an arbitrated loop.

C

CLI Command line interface. Interface that depends entirely on the use of commands, such as through telnet or SNMP, and does not involve a GUI.

compact flash Flash (temporary) memory that is used in a manner similar to hard disk storage. It is connected to a bridging component which connects to the PCI bus of the processor. Not visible within the processor's memory space.

CRC Cyclic redundancy check. A check for transmission errors that is included in every data frame.

D

data word A type of transmission word that occurs within frames. The frame header, data field, and CRC all consist of data words.

defined zone configuration The set of all zone objects defined in the fabric. May include multiple zone configurations.

DLS Dynamic load sharing. Dynamic distribution of traffic over available paths. Allows for recomputing of routes when an Fx_Port or E_Port changes status.

domain ID Unique identifier for all switches in a fabric, used in routing frames. Usually automatically assigned by the principal switch, but can be assigned manually. The domain ID for an HP switch can be any integer between 1 and 239. Generally, the default domain ID is 1.

E

E_D_TOV Error detect time-out value. The minimum amount of time a target waits for a sequence to complete before initiating recovery. Can also be defined as the maximum time allowed for a round-trip transmission before an error condition is declared.

E_Port Expansion port. A type of switch port that can be connected to an E_Port on another switch to create an ISL.

EE_Credit End-to-end credit. The number of receive buffers allocated by a recipient port to an originating port. Used by Class 1 and 2 services to manage the exchange of frames across the fabric between source and destination.

EIA rack A storage rack that meets the standards set by the Electronics Industry Association.

enabled zone configuration The currently enabled configuration of zones. Only one configuration can be enabled at a time.

end-to-end flow control Governs flow of class 1 and 2 frames between N_Ports.

error As applies to fibre channel, a missing or corrupted frame, time-out, loss of synchronization, or loss of signal (link errors).

exchange The highest level fibre channel mechanism used for communication between N_Ports. Composed of one or more related sequences, and can work in either one or both directions.

F

F_Port Fabric port. A port that is able to transmit under fabric protocol and interface over links. Can be used to connect an N_Port to a switch.

fabric A fibre channel network containing two or more switches in addition to hosts and devices. May also be referred to as a switched fabric.

fabric name The unique identifier assigned to a fabric and communicated during login and port discovery.

FCIA Fibre Channel Industry Association. An international organization of fibre channel industry professionals. Among other things, provides oversight of ANSI and industry developed standards.

FCP Fibre channel protocol. Mapping of protocols onto the fibre channel standard protocols. For example, SCSI FCP maps SCSI-3 onto fibre channel.

FCS switch Fabric Configuration Server Switch. One or more designated HP switches that store and manage the configuration and security parameters for all switches in the fabric.

fill word An IDLE or ARB ordered set that is transmitted during breaks between data frames to keep the fibre channel link active.

FL_Port Fabric loop port. A port that is able to transmit under fabric protocol and also has arbitrated loop capabilities. Can be used to connect an NL_Port to a switch.

FRU Field-Replaceable Unit. A component that can be replaced on site.

FS Fibre Channel Service. A service that is defined by fibre channel standards and exists at a well-known address. For example, the Simple Name Server is a fibre channel service.

FSP Fibre channel service protocol. The common protocol for all fabric services, transparent to the fabric type or topology.

FSPF Fabric shortest path first. HP's routing protocol for fibre channel switches.

Fx_Port A fabric port that can operate as either an F_Port or FL_Port.

G

G_Port Generic port. A port that can operate as either an E_Port or F_Port. A port is defined as a G_Port when it is not yet connected or has not yet assumed a specific function in the fabric.

H

hard address The AL_PA that an NL_Port attempts to acquire during loop initialization.

I

idle Continuous transmission of an ordered set over a fibre channel link when no data is being transmitted, to keep the link active and maintain bit, byte, and word synchronization.

integrated fabric The fabric created by connecting multiple HP switches with multiple ISL cables, and configuring the switches to handle traffic as a seamless group.

isolated E_Port An E_Port that is online but not operational due to overlapping domain IDs or nonidentical parameters (such as E_D_TOVs).

K

K28.5 A special 10-bit character used to indicate the beginning of a transmission word that performs fibre channel control and signaling functions. The first seven bits of the character are the comma pattern.

kernel flash Flash (temporary) memory connected to the peripheral bus of the processor, and visible within the processor's memory space. Also known as “user flash”.

L

L_Port Loop port. A node port (NL_Port) or fabric port (FL_Port) that has arbitrated loop capabilities. An L_Port can be in one of two modes:

Fabric mode: Connected to a port that is not loop capable, and using fabric protocol.

Loop mode: In an arbitrated loop and using loop protocol. An L_Port in loop mode can also be in participating mode or non-participating mode.

latency The period of time required to transmit a frame, from the time it is sent until it arrives. Together, latency and bandwidth define the speed and capacity of a link or system.

link As applies to fibre channel, a physical connection between two ports, consisting of both transmit and receive fibres.

link services A protocol for link-related actions.

LIP Loop initialization primitive. The signal used to begin initialization in a loop. Indicates either loop failure or resetting of a node.

LM_TOV Loop master time-out value. The minimum time that the loop master waits for a loop initialization sequence to return.

loop failure Loss of signal within a loop for any period of time, or loss of synchronization for longer than the time-out value.

loop initialization The logical procedure used by an L_Port to discover its environment. Can be used to assign AL_PA addresses, detect loop failure, or reset a node.

Loop_ID A hex value representing one of the 127 possible AL_PA values in an arbitrated loop.

LPSM Loop Port State Machine. The logical entity that performs arbitrated loop protocols and defines the behavior of L_Ports when they require access to an arbitrated loop.

LWL Long wavelength. A type of fiber optic cabling that is based on 1300mm lasers and supports link speeds up to 2 Gbit/sec. May also refer to the type of transceiver.

M

master port The port that determines the routing paths for all traffic flowing through a trunking group. One of the ports that is in the first ISL in the trunking group is designated as the master port for that group.

MIB Management Information Base. An SNMP structure to help with device management, providing configuration and device information.

multicast The transmission of data from a single source to multiple specified N_Ports (as opposed to all the ports on the network).

N

N_Port Node port. A port on a node that can connect to a fibre channel port or to another N_Port in a point-to-point connection.

name server Frequently used to indicate Simple Name Server.

NL_Port Node loop port. A node port that has arbitrated loop capabilities. Used to connect an equipment port to the fabric in a loop configuration through an FL_Port.

node A fibre channel device that contains an N_Port or NL_Port.

non-participating mode A mode in which an L_Port in a loop is inactive and cannot arbitrate or send frames, but can retransmit any received transmissions. This mode is entered if there are more than 127 devices in a loop and an AL_PA cannot be acquired.

Nx_Port A node port that can operate as either an N_Port or NL_Port.

P

packet A set of information transmitted across a network.

participating mode A mode in which an L_Port in a loop has a valid AL_PA and can arbitrate, send frames, and retransmit received transmissions.

path selection The selection of a transmission path through the fabric. HP switches use the FSPF protocol.

phantom address An AL_PA value that is assigned to an device that is not physically in the loop. Also known as phantom AL_PA.

phantom device A device that is not physically in an arbitrated loop but is logically included through the use of a phantom address.

PLOGI Port login. The port-to-port login process by which initiators establish sessions with targets.

point-to-point A fibre channel topology that employs direct links between each pair of communicating entities.

port cage The metal casing extending out of the fibre channel port on the switch, and into which a GBIC or SFP transceiver can be inserted.

Port_Name The unique identifier assigned to a fibre channel port. Communicated during login and port discovery.

POST Power On Self-Test. A series of tests run by a switch after it is powered on.

primary FCS switch Primary fabric configuration server switch. The switch that actively manages the configuration and security parameters for all switches in the fabric.

private loop An arbitrated loop that does not include a participating FL_Port.

private NL_Port An NL_Port that communicates only with other private NL_Ports in the same loop and does not log into the fabric.

public device A device that supports arbitrated loop protocol, can interpret 8-bit addresses, and can log into the fabric.

public loop An arbitrated loop that includes a participating FL_Port, and may contain both public and private NL_Ports.

public NL_Port An NL_Port that logs into the fabric, can function within either a public or a private loop, and can communicate with either private or public NL_Ports.

Q

quad A group of four adjacent ports that share a common pool of frame buffers.

R

R_A_TOV Resource allocation time-out value. The maximum time a frame can be delayed in the fabric and still be delivered.

RAID Redundant Array Of Independent Disks. A collection of disk drives that appear as a single volume to the server and are fault tolerant through mirroring or parity checking.

request rate The rate at which requests arrive at a servicing entity.

route As applies to a fabric, the communication path between two switches. May also apply to the specific path taken by an individual frame, from source to destination.

routing The assignment of frames to specific switch ports, according to frame destination.

RR_TOV Resource recovery time-out value. The minimum time a target device in a loop waits after a LIP before logging out a SCSI initiator.

RSCN Registered state change notification. A switch function that allows notification of fabric changes to be sent from the switch to specified nodes.

S

SAN Storage Area Network. A network of systems and storage devices that communicate using fibre channel protocols.

SDRAM The main memory for the switch.

sequence A group of related frames transmitted in the same direction between two N_Ports.

service rate The rate at which an entity can service requests.

single mode The fiber optic cabling standard that corresponds to distances of up to 10 km between devices.

SNMP Simple Network Management Protocol. An internet management protocol that uses either IP for network-level functions and UDP for transport-level functions, or TCP/IP for both. Can be made available over other protocols, such as UDP/IP, because it does not rely on the underlying communication protocols.

SNS Simple Name Server. A switch service that stores names, addresses, and attributes for up to 15 minutes, and provides them as required to other devices in the fabric. May also be referred to as directory service.

switch Hardware that routes frames according to fibre channel protocol and is controlled by software.

switch port A port on a switch. Switch ports can be E_Ports, F_Ports, or FL_Ports.

SWL Short wavelength. A type of fiber optic cabling that is based on 850mm lasers and supports link speeds up to 2 Gbit/sec. May also refer to the type of transceiver.

T

tenancy The time from when a port wins arbitration in a loop until the same port returns to the monitoring state. Also referred to as loop tenancy.

throughput The rate of data flow achieved within a cable, link, or system. Usually measured in bps (bits per second).

topology As applies to fibre channel, the configuration of the fibre channel network and the resulting communication paths allowed. There are three possible topologies:

Point to point: A direct link between two communication ports.

Switched fabric: Multiple N_Ports linked to a switch by F_Ports.

Arbitrated loop: Multiple NL_Ports connected in a loop.

transmission character A 10-bit character encoded according to the rules of the 8b/10b algorithm.

transmission word A group of four transmission characters.

trap (SNMP) The message sent by an SNMP agent to inform the SNMP management station of a critical error.

U

U_Port Universal port. A switch port that can operate as a G_Port, E_Port, F_Port, or FL_Port. A port is defined as a U_Port when it is not connected or has not yet assumed a specific function in the fabric.

W

well-known address As pertaining to fibre channel, a logical address defined by the fibre channel standards as assigned to a specific function, and stored on the switch.

workstation A computer used to access and manage the fabric. May also be referred to as a management station or host.

WWN World Wide Name. An identifier that is unique worldwide. Each entity in a fabric has a separate WWN.

Z

zone A set of devices and hosts attached to the same fabric and configured as being in the same zone. Devices and hosts within the same zone have access permission to others in the zone, but are not visible to any outside the zone.

zone configuration A specified set of zones. Enabling a configuration enables all zones in that configuration.

Index

G

H

I

J

K

L

M

N

U

V

W

Z